124 WAYS YOU CAN TEST CAMERAS LENSES AND EQUIPMENT

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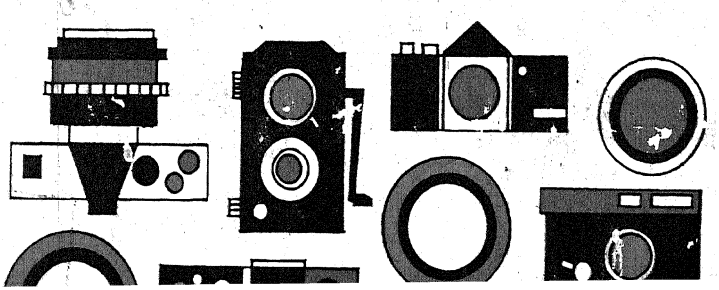
COMPILED & EDITED BY HERBERT KEPPLER



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Herbert Keppler

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ABOUT THESE TESTS

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Is the camera or other piece of photographic equipment you want to buy (or already own) working as well as it should? Do you feel it should be working better? How can you test every important piece of equipment—camera, lens, meter, projector, screen, enlarger, tripod—to make sure it's in top shape?

This book contains all the information you will need to make absolutely sure that your camera *is* in top shape. You will find practical simple tests that you can make swiftly, as well as more comprehensive tests that you can make at your leisure. You can take your testing easily or become a photo hypochondriac. The medicines are all here. Most tests are explained in a way so that even a beginning photographer can perform them. On the other hand, they are just as meaningful for the most careful professional worker. Like the variations of recipes in a good cookbook, however, you will find more than one method of doing a specific test.

The reasons why more than one method is often included for testing the equipment's ability in a specific area are understandable. Specifically, some tests although not complete and positive can give you a quick indication as to whether you are getting adequate performance from your camera. Such tests can be performed swiftly in emergency situations where the time for the more complete test just isn't available.

At other times, at your own convenience, you may want a more exacting test which will give you far more specific information on performance ratings. This is particularly true of the most popular question: "How good is my lens?"

We have noted, however, that in buying a new camera many items must be tested and we've therefore included a precise 46 point camera check which you can perform partly at the camera store before buying and partly at home during the money-back guarantee period.

Admittedly, some tests for specific information are somewhat complicated. But with them, a camera user can find out what he wishes to know without resorting to an expensive testing laboratory or repair shop.

Before going on to the tests, some essential statements concerning equipment and the need for testing must be made.

While both the manufacturer and dealer attempt to deliver equipment in top working order, slip-ups which can't be caught do occur. A slightly careless inspection may let some deficiency pass. Much equipment is shipped over great distances. A carelessly treated crate or an instrument that hasn't been packed tightly enough may cause either permanent damage or misalignment which may necessitate readjustment.

All reputable dealers stand behind equipment they sell. However, unless you know how to make tests swiftly and decisively, the guarantee period may be over before you discover the defects. Such an event can be costly.

When purchasing used equipment, even more dangers are encountered. As conscientiously as a dealer may try to examine used equipment and clean it properly before selling it, only actual use of the camera can turn up the defects. Frankly, it is inadvisable to purchase used equipment if you can afford the new. No matter how glittering the equipment may look externally, it's very difficult to ascertain how the camera was treated by its former owner. By making the proper tests, however, even these chances can be minimized.

You should constantly test the equipment you already own. Like any other instrument, changes do occur as you use it. Actually, lack of use, or minimum use, can sometimes cause more trouble than overuse—particularly in such areas as shutters and automatic diaphragms of reflex cameras. Fast, easily performed tests can be made using the last few frames on a roll of film you haven't quite finished. Testing your equip-

ment should become as regular (if not as often) as brushing your teeth.

In photography, with the many steps from the choice of film through loading, focusing, exposing, developing, printing or processing, plus enlarging and projection, there are so many possible areas of malfunction that it may be difficult for the photographer to isolate which one is at fault—if he notices it at all. A $450 camera with the best film and proper exposure can yield incredibly poor prints if a damaged or low grade enlarging lens or projector lens is used. We will therefore analyze and test each piece of equipment separately so no lack of quality in one piece of equipment can be attributed to another.

We hope in this book to help you maintain your equipment in peak condition. From that point on, your ability as a photographer must take over.

OPTICAL TESTS

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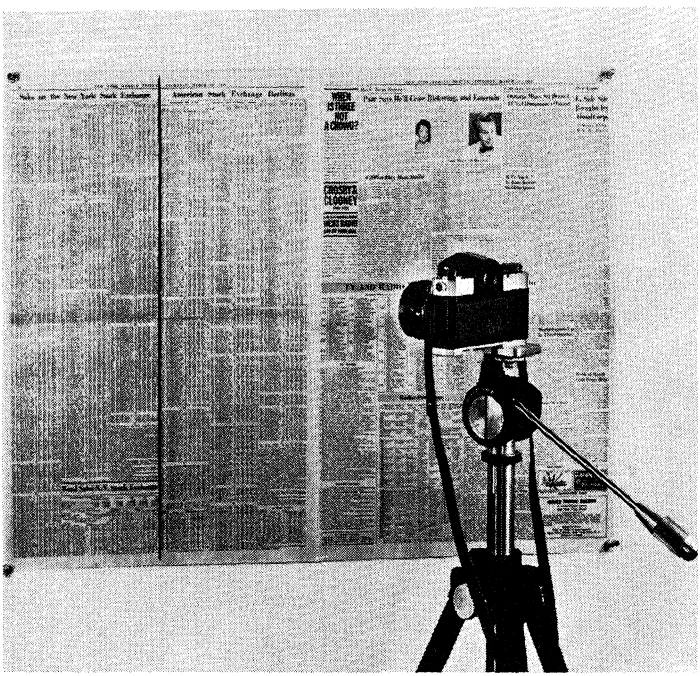
1. Camera Alignment Test

When a camera takes unsharp pictures, the camera owner often places the fault immediately on the lens. More often than not the fault lies elsewhere. Often the cause is camera and lens misalignment. In the case of a rangefinder camera, this simply means that the rangefinder is showing the two superimposed images at a different focusing distance than the camera, and the lens is actually focusing sharply. In a reflex camera, it means that either the camera focal plane, ground glass or mirror system is out of alignment. No matter the camera type, the same rather simple test should be made —before you make any lens tests. After all, if your camera and lens combination are not properly aligned no lens test is going to prove much except the obvious fact that you can take unsharp pictures. Here's the simplest and yet the most effective alignment test we know:

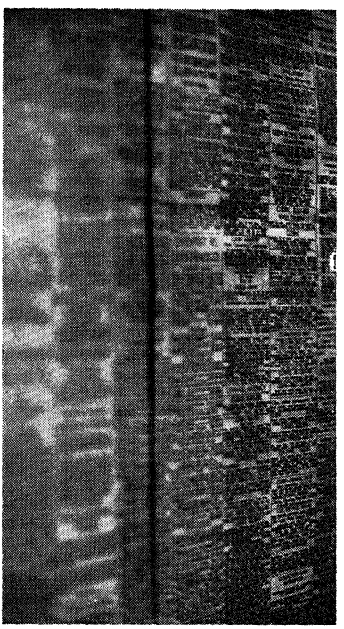
1. Using masking tape, tack a double-page newspaper spread with fine print (classified advertising will do) on a wall and, with a heavy grease pencil, draw a vertical line down the middle of one sheet.

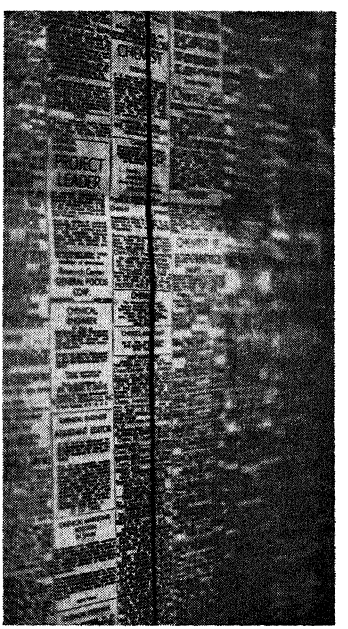
2. Load your camera with Kodak Plus-X or any other fine or medium fine grain film.

3. With your camera on a tripod at approximately the height of the middle of the newspaper, place your camera to



• To test camera body and lens alignment, tape classified ad or stock market quotation newspaper page to wall, draw line down center, light evenly, set camera at 45° to line, and focus carefully at close distance (Test 1).





• If sharpest focus made in test at left is in front of line or behind it (left above), camera and lens are not aligned. A repairman is needed. All's well if line is sharpest plane on negative or enlarged print (right) (Test 1).

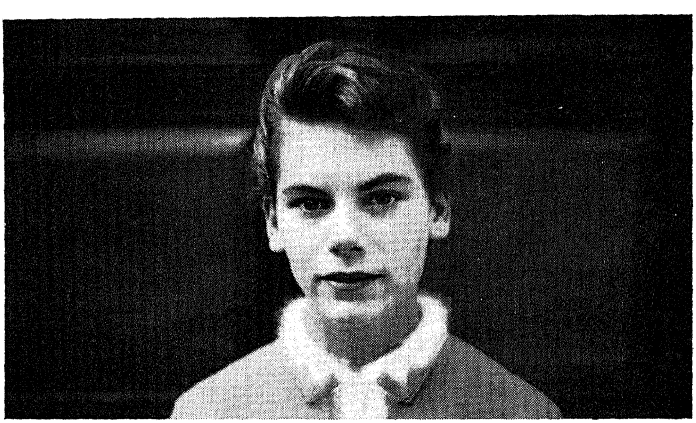
the side of the paper at an angle of about 45 degrees, 3 feet from the paper.

4. Focus on the vertical line.

5. Using either daylight filtering into the room or artificial light, shoot a picture at maximum aperture.

6. Examine the negative with a magnifying glass. If the black line is sharp and definition falls off in front of it and behind it, the camera body itself is properly aligned. If some other plane is slightly sharper than the line, there is some misalignment in the rangefinder, the camera body, the lens focusing (in rangefinder cameras), or the camera body, ground glass or mirror (in reflex cameras). The camera must be realigned by a qualified camera repairman before you can make any lens tests or use the camera with confidence.

We should warn that sometimes you may find rangefinder camera focusing mounts that do not agree with the rangefinder image at the infinity mark. This is not too serious. Most camera manufacturers attempt to maintain extreme accuracy at short focusing distances where depth of field is quite limited. At such distances a slight rangefinder error will produce unsharp results. At infinity, however, the great depth of field will easily cover any small discrepancy. As a matter of fact, some years ago a number of manufacturers considered removing the infinity marking altogether!



• Need a fast test for rangefinder accuracy? Shoot subject at close distance, focus on eyes. Check results (Test 2).

A last warning. If you find that the mark on your lens mount focusing scale doesn't seem to correspond to the measured distance at which the camera actually focuses, make sure you read your camera instruction booklet carefully. Most camera manufacturers measure distances from the film plane of the camera, not from the front of the lens mount. However some lens makers, in an effort to prove how close their lenses can focus, measure from the front of the lens. Before getting into a huff, make sure you are measuring distance from the right plane.

2. Rangefinder Focus Test

Here's a quick check used by professionals:

1. Ask a subject to face you directly.
2. Stand directly in front of the subject at a distance of about 3 to 3½ feet. Open your lens to full aperture.
3. Focus carefully on the subject's eyes and take a few pictures, exposing properly. It doesn't matter whether you use black and white or color film.
4. After the film is processed, have an enlargement made or examine it with a 10X or stronger magnifier.
5. The eyes should be sharp, the ears and nose out of focus. If the nose or ears are sharper than the eyes, your rangefinder-lens alignment probably needs adjustment.

3. Reflex Camera Rangefinder Test

Many of today's single lens reflex cameras have both a ground glass focusing area and a central split image rangefinder. Obviously these two focusing methods when used separately on the same subject at the same distance should agree with each other—the two halves of the rangefinder image should be properly aligned at the same distance that the ground glass image is at its sharpest.

While most cameras do have compatible rangefinder and ground glass images, we have seen some units where the two did not line up. To make sure yours will line up try this test.

1. Focus the ground glass carefully on a fairly close, easy-to-focus-on subject. The edge of a wood bookcase or the back of a book in the case will do.

2. Check the split-image rangefinder images. They should be aligned or extremely close to it.

3. If they seem to be slightly off, refocus the camera using the rangefinder. When you check the ground glass there's a good chance you will find it as sharp or slightly sharper than it first appeared. There's a good reason for this. It's easier to focus a split image rangefinder on a clean cut stationary vertical line object such as a bookcase or book back than it is to find the point of sharpest focus on a ground glass. If, however, your ground glass image is slightly unsharp when your split image rangefinder is in focus, and can be made sharper by turning the focusing mount, you have a very legitimate complaint to take to your dealer or manufacturer.

Although we strongly recommend at this time that you have your camera repaired if the rangefinder ground glass disparity exists, you may wonder just which image is correct —if any! To check, carry out Test 1, Camera Alignment, once with the rangefinder focusing, once with ground glass. Then compare the results.

4. Infinity Lens Sharpness Test

A camera-lens combination should produce pictures close-up as well as at infinity. In a camera that has been dropped, the focusing ring, lens mount or infinity stop can be damaged in such a way that only the infinity focus is rendered useless. Here's how to test your lens at infinity:

1. Focus at infinity and make a few exposures with the camera on a tripod. Use a moderately fine grain film and developer combination. View the negatives with a 10X to 20X magnifier.

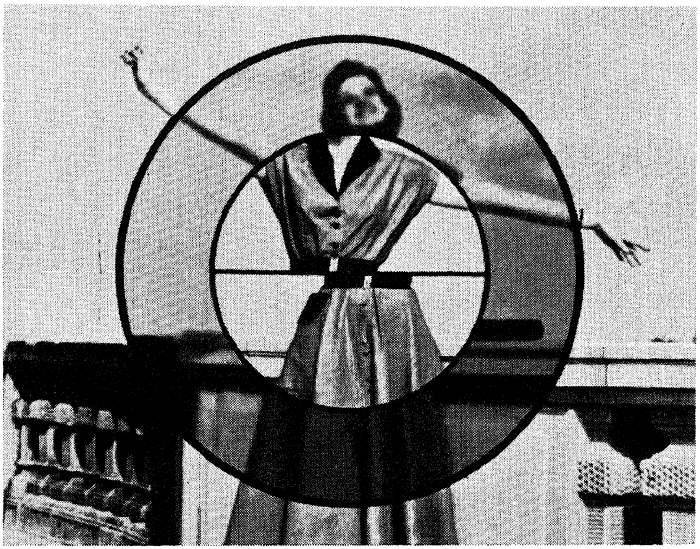
2. If you have a steady enlarger, make a 10X enlargement on glossy paper. A sharp negative or print will indicate that your infinity focus is fine.

5. Full Aperture Lens Test

The easiest method for testing your own lens at widest aperture is to use it that way.

1. Set your camera on a tripod and focus about 3½ feet from a brick wall.

2. Use a moderately fine grain film and developer combination.



• An out-of-focus reflex rangefinder looks like this. In focus, ground glass and rangefinder give image below (Test 3).

3. Take a few photos at the widest aperture using the appropriate shutter speed for correct exposure.

4. View the negatives with a 10X to 20X magnifying glass, or make a 10X enlargement with a steady enlarger (use glossy enlarging paper).

You will probably find that sharpness falls off in the corners. It's for you to decide if the fall-off is acceptable or severe enough to be objectionable.

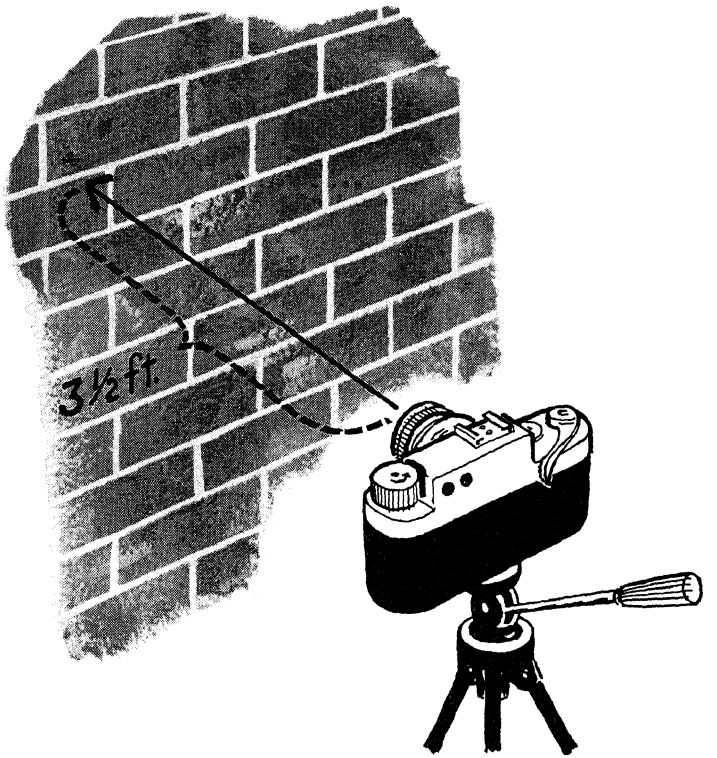
6. True Lens Aperture Test

Is an f/1.4 lens really f/1.4? As far as theoretical light transmission is concerned, it most likely is since the f/stop is actually calculated by measuring the focal length of the lens and establishing a mathematical ratio with the effective aperture. However, the f/stop does not tell you how much light is actually transmitted, but just how much it is theoretically possible to transmit. Some professional lenses are calibrated in "T" stops instead of, or in addition to, f/stops. The T stop is an actual measurement of the amount of light transmitted and would be more helpful to photographers than the f/stop if it were in universal use, but it's not. You cannot test for the T stop. A qualified optical expert, however, does have the proper optical instruments for so-called "T"-stopping a lens, if you wish. Thus many f/1.4 lenses will turn out to be closer to f/1.5, in terms of actual light emission. The difference is so slight as to have no effect whatsoever on normal picture taking even under the most exacting conditions.

To make you feel better, though, we should point out that the T/stop is not the last word either. While it is an accurate measurement of the light transmitted by the lens it is not a measurement of the *usable* light transmitted. Such extraneous light as flare is also counted into the T/stop. We'll reach a proper designation and a way of calculating it eventually. In the meantime, use the f/stops on your camera and stop worrying about them.

7. Effective Aperture Test

If you own a view or press camera which has a removable ground glass back, you can check the effective aperture of the lens at any opening as follows:



• If you must make a brick wall lens test, don't get further than 3½ feet, put camera on tripod, make sure it's absolutely parallel to wall (Tests 5 and 8).

1. Focus the camera and lens at a distant object.
2. Replace the ground glass with an opaque material that has a central pinhole.
3. Under a proper safelight, cut a piece of enlarging paper into a circle just small enough to fit over the front of the lens, underneath the lens cap.
4. Place a light behind the pinhole so that the enlarging paper will be exposed. It's advisable to make several exposures on a number of round, specially cut enlarging papers.
5. Develop the enlarging paper discs. In the center will be a black round disc.
6. Measure the diameter of this disc. Divide the focal length of the lens by this measured length and you will have the relative aperture f-number.

8. Critical Aperture Test

1. Make a series of exposures of a brick wall. Use tripod, cable release, and a moderately fine grain film and developer combination.
2. Focus your camera 3½ feet from a brick wall and make a series of six exposures starting at the widest aperture.
3. Stop down one f-stop from each consecutive exposure (adjusting shutter speeds for correct exposure).
4. Examine negative with a 10X to 20X magnifier. The critical aperture will obviously produce the sharpest frame.

9. Lens Vignetting Test

Some lenses at full opening do not transmit as much light to the negative or transparency corners as they do to the center. This causes a hot spot in the center of the picture area with a loss of light at the edges. The lens itself may not always be the culprit. Vignetting can also be caused by an insufficiently large lens barrel or lens mount diameter. The mount opening itself on the camera may be insufficiently large to allow the edges of the picture to receive enough illumination. This type of vignetting is more prevalent with tele and long focal length lenses than with normal or wide angle lenses. To test for vignetting, proceed as follows:

1. Outdoors, point your camera at a clear blue sky, or in-

doors, at a white wall, cardboard or piece of paper which is evenly illuminated.

2. Make a series of exposures at all apertures varying shutter speed to keep exposures equal. Any medium or fine grained black-and-white film can be used.

3. When you develop the film, examine the negatives closely. Density should be even from edge to edge and corner to corner. With fast lenses having apertures of f/2 or larger some light fall off must be expected at full aperture but this should not be great. If instead of a simple light fall off, the image seems obscured in the corners, the vignetting is being caused by the lens barrel, lens mount or camera mount.

10. Lens Barrel and Pincushion Test

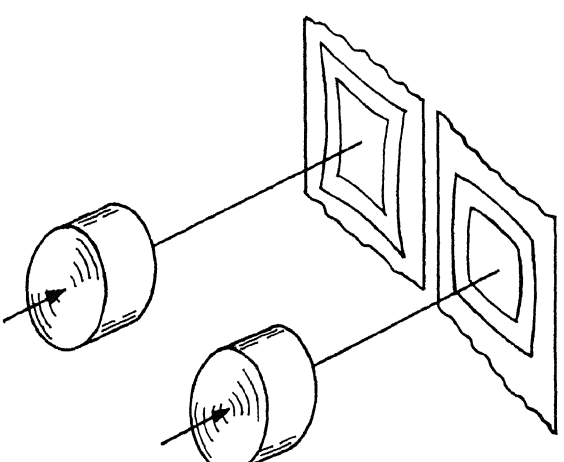
Photograph a flat subject with horizontal and vertical lines. A brick wall will do. Are the lines at the picture edges straight or do they curve? Lines curving inward towards the center indicate pincushion distortion. Lines curving outward indicate barrel distortion. Such distortions are most common in zoom

• Do your prints or transparencies seem brighter in the center than at the edges? There's a good chance lens vignetting may be causing it (Test 9).

lenses. Obviously such a lens is unsuitable for any kind of photography in which perpendicular or horizontal lines are important—as in copy work or architectural photography.

11. Lens Coloration Test

We seldom consider the fact that the color of the optical glass itself, or its anti-reflection coating, can definitely affect the overall color rendition of color pictures. That's why we often speak of "warm" lenses (those which impart a yellowish color) or "cold" lenses (those which have a bluish cast and impart that to the transparency). Simply to look at the surface of a lens or to look through it and note the apparent color (generally caused by the coating) will give you little indication of the lens' coloration. Only actual picture taking will do that. No lens should be discarded because it tends to make all your pictures slightly blue or slightly warm. If you find that is the case, a color compensating filter should be used to correct it. If you have two lenses of different manufacture, aperture or focal length, take pictures with both of the same subjects under the same lighting and note any difference in coloration.



• Two annoying distortions, particularly if you shoot pictures of buildings, are pincushion distortion and the opposite, barrel distortion (Test 10).

If you do see a difference, there is no need to do anything about it unless it bothers you. The difference can be bothersome when you happen to be shooting a picture sequence and change lenses between shots. A slight change in overall color balance will be annoying. Pick the lens whose color you like best and use proper filtration to balance the second lens against it. If color-matched lenses are important to you, it's wise to stick to one lens brand when buying lenses of different apertures and focal lengths. Brands made for specific camera types are generally quite carefully color-matched.

12. Lens Coating Test

It's fairly easy to check a lens for coating. Look through it. A coated lens will have a slightly blue or amberish color. An uncoated lens has either no coloration or an insipid yellowish color.

Extensive tests have failed to prove the superiority of any one factory coating system. Lenses originally coated at the lens factory before assembly are definitely superior—as far as coating goes—to lenses taken apart after assembly and coated

• See how building edge curves inward at left and line of windows at right is distorted in like manner. This is pincushion distortion, common in zoom lenses (Test 10).

to improve their performance. Coating an uncoated lens will definitely improve its performance, but there's a good chance that more harm than good will come if it is not dissassembled and reassembled with the utmost care. Test any post-manufacture coated lens most carefully with all lens tests in this book.

How can you be sure that a lens is factory coated? At one time this was quite a simple matter. All factory coated lenses had a code letter engraved on the front lens collar, generally a T or C in red. This practice has been dropped by most lens manufacturers and it is now virtually impossible to tell a factory coated lens from a post-factory coated lens.

13. Lens Discoloration Test

Many old lenses have a slight frontal discoloration, generally bluish in nature, which resembles regular fluoride lens coating.

• Was your lens coated at the factory when the lens was made or was it coated later? The most effective coatings are put on at the factory. This sign indicates factory coating (Test 12).

The discoloration can often be mistaken for such. Oddly, an older lens suffering from discoloration should not be rejected. The discoloration often does act in some slight manner as a coating. In any case, it's doubtful that this discoloration will hurt the picture taking quality of the lens.

If someone offers to sell you a lens and claims that it is a coated optic but you're not sure, better check as follows:

1. Hold the lens so that a bright light is reflected from its front surface. If the surface seems to have a rainbow effect or the coating seems uneven, chances are the lens has no regular coating but simply a discoloration.

14. Lens Bubble Test

Lens bubbles have haunted photographers since the first picture was taken through the first lens. Almost all lenses have small air bubbles within one or more glass elements. These can readily be seen by looking directly through the lens. The question is: Do they actually affect your picture? We have yet to find a lens suffering in quality because of excessive air bubbles. We have found many lenses that seemed to have a fantastic number of bubbles that nonetheless yielded excellent pictures. When you get poor definition with lenses that do have bubbles the trouble probably lies elsewhere. Despite claims by various lens manufacturers for and against bubbles, we feel that a lens specifically for bubbles is unnecessary and impractical. Test any lens, with or without bubbles, with the tests as outlined elsewhere in this book.

15. Spherical Aberration Lens Test

A lens with a spherical aberration will show a halo of light around any small light source that it is sharply focused upon. Absence of halo means the lens doesn't have objectionable spherical aberration. On the other hand, the presence of the halo does not necessarily indicate the presence of spherical aberration. Flare can also cause a halo. If you have a camera with through-the-lens focusing, make this further test to find if the fault is spherical aberration or flare:

1. From black paper, cut a small circular disc with a diameter about ¾ the size of the front element of the lens.

2. Point the camera at a bright object with the lens open to full aperture.

3. Remove the paper, close the lens down two or three stops, and examine the image on the ground glass. If it is no longer at its sharpest point but must be refocused, the lens definitely has spherical aberration.

16. Chromatic Aberration Lens Test

1. Fasten a sheet of newspaper to a wall with masking tape. The fine print used in a classified advertising section is ideal.

2. Photograph it through a blue filter or by blue light after focusing carefully.

3. Rephotograph it on the same roll of film with a yellow or yellow-green filter. If both shots are equally sharp when the negatives are processed and examined, the lens can be rated sufficiently free from chromatic aberration for serious professional photographic work.

17. Lens Flare Test

1. Construct or obtain a box whose sides are at least 2 ft. square. Paint it black.

2. Place the box on a stand or tripod so that you can crouch to the side and underneath it and photograph it against the sky. The opening of the box should be toward the camera.

3. Photograph the box against the sky with the box centrally located in the finder. The sky should show on at least three sides of the negative. Expose for sky, not for the box.

4. Develop the negative and examine the image of the box carefully. It should be absolutely clear and transparent. If the entire box is fogged the lens probably suffers from an excessive case of flare. The fog is a direct measurement of it. Make sure you develop the film properly and that the fog you're seeing is image fog and not development fog. If in doubt, compare the fog in the negative area with the clear imageless edges of the negative. If there is the same amount of fog on the negative edges, it's development fog. If the image of the box is definitely more opaque than the negative edges, it's lens flare.

18. Lens Flare Spot Test

Flare may not only cause a general fogging but an actual flare spot or ghost image. Here's a simple test to see whether your lens suffers from defects which would produce such phenomena:

1. Against a dark unlit background, light a small brilliant point light source. A 60 to 100 watt bulb shielded with a metal hood in which a small hole has been drilled can serve as the test object.
2. Focus your camera carefully on this point source image and photograph it at full aperture in the exact center of the negative area.
3. Now take another photograph with the point source in one corner of the negative. Examine the two developed negatives carefully. If the second negative shows a halo of light in the center although the point light source has been moved aside, the lens has a rather usual type of flare. If the halo moves right along with the pin-point light source, the lens is producing a secondary ghost image which is out of focus. Surprisingly, by trial and error, you could probably refocus the camera and shoot a picture of the ghost image sharp and the true pinpoint unsharp. The really dangerous type of flare spot or ghost image to be wary of is indicated by the halo moving in the opposite direction from the pinpoint of light. Since the halo no longer can be identified with the light source, it may appear, very much unwanted, in an unlit part of the subject and ruin your pictures.

19. Lens Centering Test

Good performance cannot be expected unless every element within a lens is accurately centered. While most lenses are correctly centered by the manufacturer, they may become uncentered through ill treatment. You can examine a removable lens for accuracy of centering quite easily:

1. Remove the lens from the camera.
2. Look through it at a candle flame.
3. Turn the lens slightly off axis and continue to look at the flame. You should now see multiple images of the flame.
4. Rotate the lens slowly. All the images of the flame should

remain stationary. If even one does not, one or more elements is not centered accurately.

20. Lens Alignment Measuring Test

While a photographic record can easily be made to show whether a lens is properly aligned to the camera, most professional repairmen use a more physical test—one which the amateur can also make on a camera with a removable lens if he has the proper equipment. It's simply this: Measure the distance between the lens flange and the film plate of the camera with a micrometer depth gauge. Most camera importers or manufacturers will supply you with the proper mount-to-film-plane distance if you request it.

21. Lens Thread Alignment Test

Cameras with interchangeable lenses are often fitted with lenses which were not original equipment on that particular camera. While this in itself is no cause for extreme worry—if the camera is tested fully as outlined elsewhere in this book—some lenses are mounted which can immediately be detected as not fitting the camera properly. Look for a mark on the lens and on the camera body indicating the point of alignment. If the two markings don't line up, reject the camera.

22. Lens Thread Wear Test

Threaded interchangeable lenses naturally wear. The amount of wear can be measured easily. If the interchangeable lens tends to wobble, thread wear should be investigated. Here's how to do it:

1. Obtain two feeler gauges (the kind used to measure spark plug gaps will do nicely).
2. With the camera body lying flat on a firm surface, press the lens mount down on to the camera body. Insert thin blades of the two feeler gauges at opposite sides of the circumference on the lens between lens mount and camera body. If a thicker gauge can be inserted on one side than on the other, the lens thread is worn and should be repaired.

23. Focusing Free Play Test

All mechanical parts of cameras wear as the camera becomes older. Some wear more quickly than others and may be difficult to repair. The focusing mechanism of your camera, whether it is part of the lens mount or the camera body, is a vital wear spot. The mechanism should have no free play. Here's how to test it:

1. Focus the camera at about 10 ft. or so and move the focusing ring or knob in one direction.
2. Stop it carefully.
3. Gently rotate the knob or ring in the other direction. It should cause the focusing to change instantly. There should be no free play before the lens begins to refocus. If there is, check with a repairman to see if this is liable to become worse and whether repair can be made easily.

24. Focal-Length Lens Test

While the normal lens for small cameras can generally be

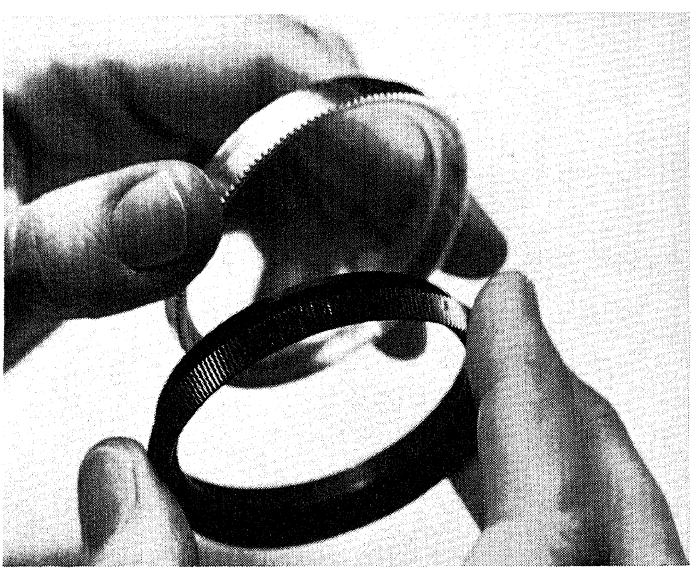
• Does your lens have excess focusing play? If so, the helial threads may be worn (Test 23).

considered accurately marked as to focal length, many are somewhat longer or shorter than marked. Older lenses for large cameras, special combinations of convertible elements, or experimental lenses you may put together yourself, may leave the exact focal length in doubt. Although it's a pesky job, here is a way to determine the exact focal length.

1. If the lens is removable from the camera, take it out and place it on a horizontal support so that you can see a distant object through it.

2. By alternatingly rotating the lens and swinging it around various vertical pivots, find a spot on the lens barrel about which the lens can be swung slightly with no visible movement of the distant object. Mark this point on the lens barrel. This is the node of emission.

3. Set up a ground glass screen behind the lens and move the screen back and forth until the image from the infinity subject is sharp.



• Lens accessories have a notorious way of screwing together so you can't get them apart. Can you tell that this will occur beforehand? Certainly. Use a dry run (Test 26).

4. Measure the distance between the image plane and the point on the barrel marking the node of emission. This distance is the true focal length of the lens.

25. Internal Lens Finish Test

1. Hold the lens over a dead black surface such as a piece of black velvet on which no light is falling.
2. Aim a strong side light at the lens itself. If the finish and polish of the lens is perfect, the lens should appear black when you look through it. If imperfectly finished surfaces are causing light scattering, the lens will appear gray instead of black.

26. Lens Accessory Fit Test

Unfortunately, many threaded lens accessories—adapter rings, retainer rings, lens hoods—fail to fit the camera lens threads or do not thread together properly. Before actually using them test their fit as follows:

1. Try to thread and adapter ring or similar metal accessory after first immersing it in warm water. Repeat after a stay in the ice box. When the temperatures of the two threaded pieces are not exactly the same there should be sufficient tolerance so that the units will not bind. Units should thread smoothly. There should be no rough spots.

27. Eisenstaedt's 35mm Camera Lens Test

Alfred Eisenstaedt states, "I know that my way of testing lenses may seem unorthodox, but I am not a complicated man. I do not test a lens scientifically. I remember only too well a number of lenses which tested poorly on an optical bench but took excellent pictures. Sometimes I shoot photographs of a chart, but very rarely. Really, I hate charts. I prefer to test a lens by actually putting it to the use I intend it. I am not a fanatic when it comes to lens tests. Some photographers spend more time testing lenses than taking pictures. I do not. Actually, I spend the least amount of time possible testing equipment.

"My lens testing doesn't take more than half an hour at most. With all lenses, I carry out the same set of practical tests. From my window in the *Life* photo lab, I shoot an

enormous radio tower about a mile away. It has terrific intricate patterns of girders and lines. Then I shoot the people in the street below, and perhaps make a few shots across at Rockefeller Center. Those are my far distance tests. I generally repeat each picture at all lens openings from the widest to the smallest, varying the shutter speed to keep proper exposure, of course. I rarely use a tripod since I can easily hand hold a shutter speed of 1/25 sec. or faster without difficulty. I use Plus-X film for all my tests. Next I photograph our secretary, and sometimes other girls around the photo lab. After all, in my work I'll be photographing people, not charts. Again, I use all lens openings.

"When the negatives are developed, I examine them with a Bausch & Lomb 3.5X magnifier. Often I also have enlargements made. When the results satisfy me, that's the lens I keep. If I see from my close-up tests that the lens is focusing before or behind the point I focused on, I have the lens adjusted properly to the camera body. That is all I do, nothing else. I don't want to know how many lines per millimeter a lens will resolve. I only ask, will the lens take good pictures? Will it do what I want?"

28. Feininger's Press and View Camera Test

Andreas Feininger says, "According to my experience, the simplest and most practical way to test a lens is to take some pictures with it, enlarge the negatives, and check the prints for sharpness. To avoid certain pitfalls which may cause unsharpness not related to the lens, follow these recommendations:

1. The lens must be absolutely clean—no dust, no fingerprints. The correct way to clean a lens is to remove carefully any grit and dust with a camel's hair brush, then to breathe on the glass and polish it gently with lens-cleaning tissue without pressing down too hard, to prevent scratching the lens coating.
2. The camera must be supported by a sturdy tripod to avoid unsharpness caused by accidental camera movement during exposure.
3. The shutter must be tripped with a cable release.
4. The test object must be flat, rich in fine detail, contrasty, and evenly illuminated. Good test objects are a rectangle formed by five printed pages from a slick-paper magazine, or a brick wall.

5. The camera must be adjusted carefully so that test object and film are parallel to one another and the lens axis is perpendicular to the plane of the test object. To achieve this adjustment is the most important, and at the same time the most difficult, part of the whole test.

6. Focus carefully on the ground glass using a 6X magnifier to achieve critical sharpness.

7. Expose correctly. Overexposure produces halation within the film emulsion and creates excessive graininess, both of which promote unsharpness.

8. Use a fine grain film and develop the negative in a fine grain developer.

9. Take a series of test shots at different diaphragm stops (and, of course, correspondingly different shutter speeds) to find out how the lens performs at different openings. Make accurate notes on each shot so you know later what's what. The best way to avoid confusion is to record the diaphragm stop and shutter speed in heavy black pencil on a piece of paper which, tacked to a corner of the test object, is photographed directly on each test negative.

10. Make 11 x 14 in. enlargements from these test negatives and check them for sharpness. Make sure that each print is "grain-sharp" from corner to corner so that unsharpness accidentally produced during enlarging is not confused with unsharpness of the lens that is being tested.

11. From time to time, rangefinder-equipped cameras should be checked to make sure that the rangefinder is still in synchronization with all the lenses to which it couples.

12. Because it is flexible, and absorbs and retains moisture, film does not always remain sufficiently flat in its holder. Particularly on humid days, film may buckle and bulge from the plane of focus to cause considerable unsharpness. This kind of unsharpness usually is confined to certain areas of the negative while other parts, particularly around the edges, are sharp.

13. Unfortunately, many view cameras are structurally rather weak. As a result, front and back of such cameras are not always parallel to one another, particularly if shots are made that require relatively long bellows extensions or the use of heavy lenses. If this is the case, the whole optical system bends out of kilter and unsharp negatives result. Such cameras can be strengthened with the aid of a piece of flat aluminum

stock, ¼ x 2 in. to support their bed."

Ever since the first photographer discovered that some lenses could reproduce a brick wall with better overall definition than others, lens testing has flourished on the same scientific footing as palmistry. Thousands of strong, innocent, excellent lenses have been sacrificed to brick walls or newspapers or test charts tacked to flat surfaces. Many a fine optic, with what seemed to be poor corner definition, has been traded away for a lesser lens which takes more kindly to brick walls.

It would seem logical that a flat surface with plenty of detail would prove an excellent test for lenses. It doesn't. Yet every careful photographer knows that we must have some way of evaluating lenses. The differences between lenses can be far too great to leave lens quality to faith or luck.

The number of factors governing overall performance is almost endless. However, there are three broad areas governing lens quality.

1. Optical design itself: Almost all optical designs are purely compromises. You can't have everything at a reasonable price. Superspeed lenses at like apertures may not have the same definition as slower ones. Lenses which function best at full apertures will almost always fall off in quality at small ones. Lenses designed for close-up work will not do as well at standard distances. Aerial lenses calculated to work at infinity will not do as well at closer distances.

2. Variations in glass: Unlike plastic, whose uniformity can be maintained to an astounding degree, batches of glass vary in structure and quality even within the same batch. These variations include differences in all the characteristics which make up a lens.

3. Variations in manufacture: Despite the highest tolerances to which grinding and polishing can be held, the mere fact that tolerances exist indicates that there will be a variation between one optical glass element and the next. Then, there are further tolerances in mounting the elements. The sum of these tolerances may be in the same direction, thus adding up to a greater variation, or they may cancel each other out to some extent.

These three groups of variables cause the differences in lenses and help to explain why *no two lenses are completely*

• A lens with field curvature will show sharpness at center if focused there (girl's eye). But it will yield blurred edges (girl's hand) even if focused at same plane as eye (Test 29).

• By moving girl's hand forward slightly so that it is closer to lens than eye, picture can actually be sharpened. But make comprehensive field curvature tests first (Test 29).

alike even if made by the same manufacturer and bearing consecutive serial numbers. Testing a single lens from a camera may tell you little about the next lens. And even the finest lens manufacturers have had quality control slip-ups. The fact is bad lenses do get through. Only by testing a lens thoroughly before the purchase is final can you be quite sure of its performance. Admittedly, there is less chance of purchasing a poor lens from a highly reputable manufacturer than from an unknown or bargain lens maker. But adequate lens testing will often uncover a perfect gem of a lens among the least expensive manufacturers. The problem is chiefly: what type of test is necessary? And how can you be sure the test really means anything?

Just to examine pictures made with the lens isn't sufficient. No exact standard of comparison exists unless the same subject is photographed at precisely the same instant with all lenses. To produce some standardization, lens owners or would-be lens owners often photograph some fairly close, flat pattern under rigid lens-to-subject and lighting conditions. By checking the sharpness and definition of the picture made at all apertures through lens A with the same pictures made with lens B, they can draw definite comparisons. In addition, the performance of a single lens can be checked—center against edge definition, sharpness at all apertures.

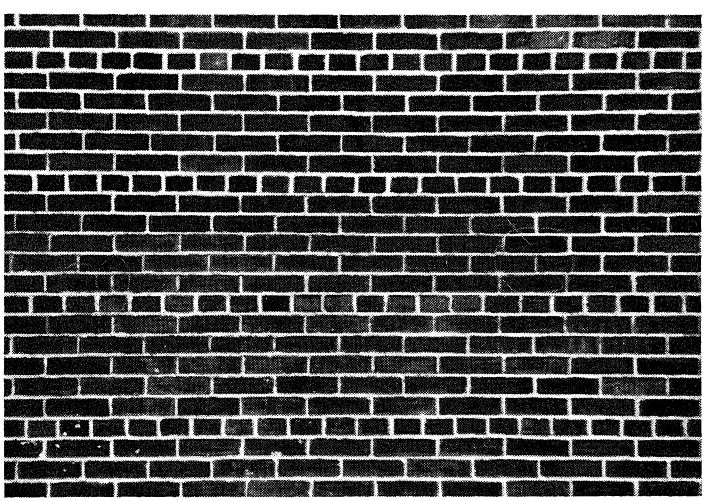
A brick wall, with its clearly defined uneven surface may be the most plentiful target but it's the most primitive test subject. An open newspaper page (preferably the want-ad section with its tiny print), pasted flat against a wall, is slightly superior to the brick wall, since you can actually compare the sharpness of the small type as seen by different lenses. Better still (though less convenient) are magazine pages pasted to a board. Magazine type is generally sharper and clearer than newspaper.

Various test charts with groups of fine lines offer an even superior theoretical basis of comparison, since the test charts are manufactured to rigid tolerances. According to the finest line group that can be seen clearly in the negative, an actual figure of resolving power (generally given in lines per mm) can be assigned to the central portion and the corners of the picture produced by any lens at all apertures. But lines per mm seem to be regarded as some sort of magic incantation for comparing lenses, and it's often misused. The lines per mm

resolved depends not only upon the quality of the lens but on the film used, the exposure, the developer, the processing procedure and the eyesight of the tester. Obviously, if these factors are not precisely equal when various lenses are tested, the tests signify little. And when tester A compares his results with tester B, the conclusions drawn therefrom may mean even less.

Thus far, we've covered only facts known and admitted, if ignored, by many technicians. Even though most lenses tested are being used to shoot three-dimensional subject material, lens testing charts, newspapers and brick walls are all flat surfaces. Since the vast run of our lenses for small popular cameras, whether Leica or Brownie, Minox or Graphic, are not designed and computed for shooting two-dimensional objects, is it reasonable to test on a two-dimensional surface?

The basic differences between lenses for photographing flat subject material and those for shooting flesh, blood and scenics can be shown most simply by examining the fast lenses designed for 35mm cameras. Lenses for reproducing flat work, including the best enlarging lenses, have what is called a flat



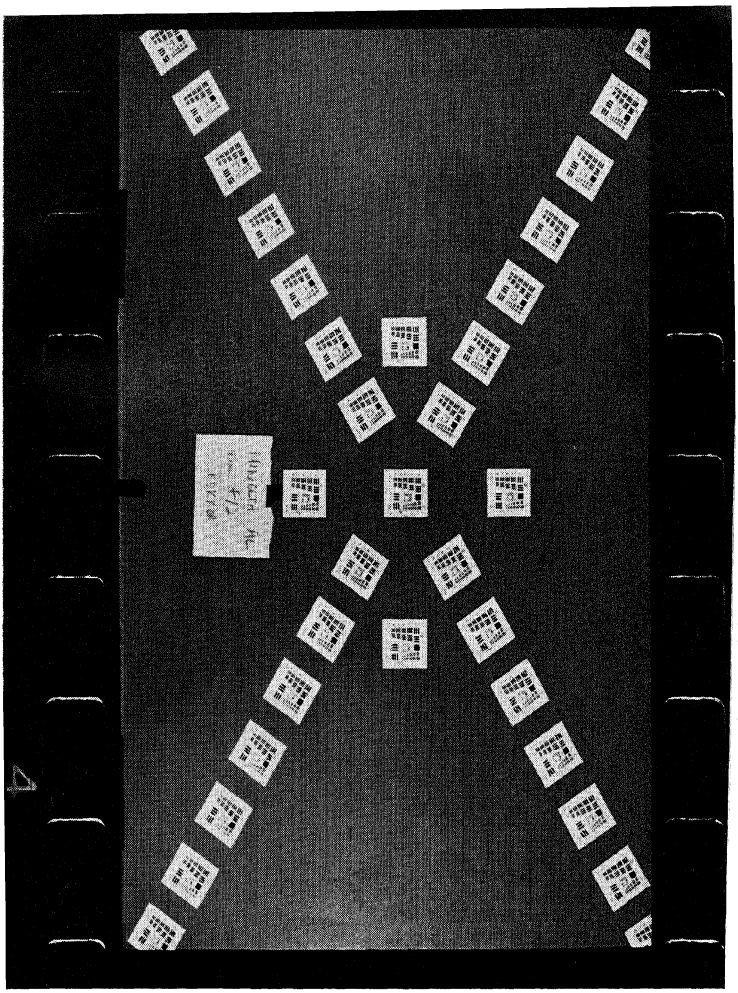
• Brick wall makes sharp, easy-to-focus-on target for lens test. But lighting doesn't remain constant and you have no way of comparing results between lenses accurately (Test 29).

field—that is, any given point in the flat subject area will come into focus on the film plane in the camera or enlarger. Since flatness of field is extremely important in these lenses, sacrifices of other qualities are often made to achieve it. One possible sacrifice is speed. The average copy of process lens has a rather small maximum aperture—f/11 or smaller isn't unusual. Even the enlarging lenses of 50mm focal length seldom open further than f/3.5.

To produce the great lens speeds—f/1.2, 1.4, 1.8, 2—for today's 35mm cameras, sacrifices must be made in other directions to keep the price and size down to reasonable proportions. At the present state of lens design, a gain in speed may necessitate a loss somewhere else—and field flatness seems a logical sacrifice. Many of these fast lenses have marked curvature of field. That is, such lenses do not focus all points of a flat field onto the film plane. The line of focus is a curve, or more correctly, a parabola, since it extends in three dimensions. As a matter of fact, to get maximum sharpness, specialized technical cameras using superfast lenses have actually been built with film planes which hold the film in a curve to correspond with the sharpness curve produced by the lens.

With a flat film plane such as exists in our 35mm cameras, however, the plane of sharpness extends as a parabola or three-dimensional curve right through our subject material. If you were to photograph an object with such a curve, it would be sharp corner to corner. But if you photograph any flat test object at full aperture, the picture will indicate that the lens is sharp only in one area of the picture, generally the center. By changing focus slightly, you can sometimes blur the center and bring the edges in sharply. To reach a happy medium of field curvature, most fast lenses for rangefinder cameras are fitted to focus somewhere between the center and the edge sharpness, with slightly more emphasis on the center, since this is the most important picture area.

Reflex cameras, on the other hand, are focused visually. When the center is as sharp as you can get it, the edges of your test pattern will be rather unsharp. In pictures taken with reflex camera lenses, therefore, the disparity between central and edge sharpness is often more pronounced than in those taken with a rangefinder camera. Central definition may be sharper, but the corners will be softer. As a matter of fact, you can actually see a fast lens' curvature of field in many reflex



• Targets showing lines per millimeter comparisons across entire field are best targets for lens test. Photo above (on its side) shows wall setup for 35mm camera test. (Test 29).

cameras having full ground-glass focusing areas. Focus with full aperture at the center. Examine the picture corners. They will be slightly out of focus. Now focus using the picture corners. The center will be unsharp. (Unfortunately this effect can't be seen on cameras having a regular condenser to brighten the prism, such as the Exakta.)

It should be quite clear that these fast lenses are not poor in quality but that they focus on a curved plane rather than a flat one.

This doesn't bother lens designers because they contend that the lenses are made to take pictures, not to test on flat objects. And, since most subject material is not flat, we can actually often improve our pictures by taking the curvature of field into consideration when shooting wide open. If we try to keep our subject material on the curve, we can get sharper pictures than if we kept it on a flat plane.

Now for some facts about the curvature of field.

1. It may become noticeable only at close focusing distances, since the depth of field (zone or sharp focus) expands sufficiently at larger distances to cancel its effects.

2. It sometimes appears only at large apertures, since the depth of field (or depth of focus) within the camera body at small apertures eliminates its effect.

3. Lenses with field curvature can copy flat work just as well as a flat field lens. Simply stop the lens down to a reasonably small aperture (which you should do in copying anyhow).

What can be done about field curvature? Above all, don't throw good lenses away because they have it. Instead, why not expand the two-dimensional tests to three-dimensional, so that you can see just how much curvature of field there is. Then you can put it to use when shooting close at large apertures.

First, make really sure that the lens has good overall definition. One simple shot will tell. Pick out a distant scene with detail in the center and the edges and shoot at full aperture using a medium or fine-grain film and a tripod. Examine the negatives, comparing central and edge definition. If there is a great disparity in sharpness, your lens may have poor edge definition aside from field curvature (also, of course, this test may indicate other weaknesses such as vignetting which do not concern us here). If your lens passes the distance test with flying colors, go on to check curvature of field.

It would be a simple matter to set up time-consuming yet comprehensive tests for curvature of field. However, let's be practical and use a technique that requires you to shoot only seven pictures, or only two if you have a single lens reflex. First, with masking tape attach to the wall a double-page newspaper spread of small type such as the classified ad section. Check that the light falling on it is even. Load your camera with fine-grain or moderately fine-grain film, place it on a tripod, and make the following series of tests at full lens opening:

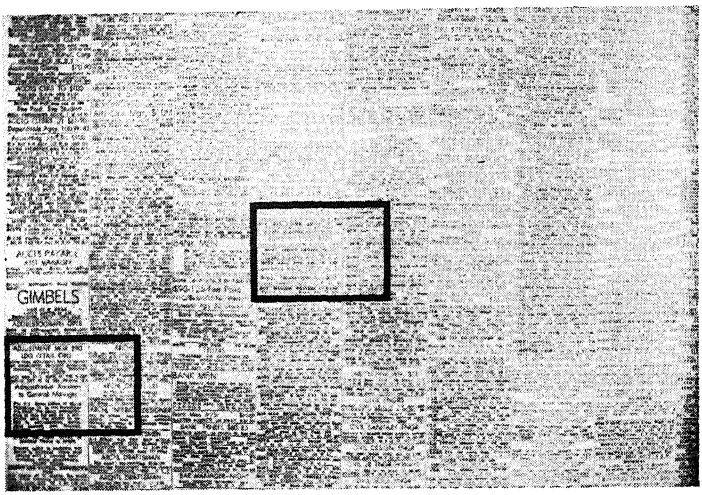
1. For a single-lens reflex with full ground-glass focusing and no thick condensing lens: Move your focusing mount until the scale indicates that it is a foot from its closest focusing distance. (For instance, if your camera focuses as close as 18 in., set to a little under 3 ft.). Now move in so that the film plane of your camera is parallel to the newspaper pages, keeping the center of the newspaper spread in the center of your ground-glass. When your image is absolutely sharp centrally, shoot a picture at the proper shutter speed for correct exposure. Now turn your focusing mount until the edge of your picture area seems sharp through the finder. Take another picture and note the focusing mount scale marking.

It's advisable to make a series of these paired shots, since the exact point of sharpest focus is sometimes difficult to ascertain on a ground glass. If you shoot more than one pair you can take an average of the focusing scale settings of edge and central sharpness.

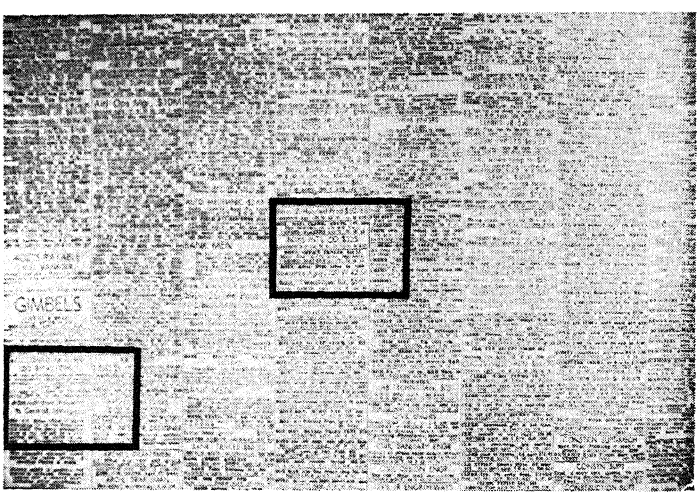
2. For non-single-lens reflex cameras, reflexes without full ground-glass focusing, and reflexes having thick condensers: At a distance of about 4 ft., focus with the rangefinder on the newspaper spread. Shoot a picture. Now move the focusing mount toward infinity. If the camera was "in focus" at 4 ft. on the scale, set the lens mount to about 4¼ ft., and take another picture. Repeat at about one-quarter foot intervals for three or more pictures. Now return the focus to the starting position, move the mount in the opposite direction, toward its closest focusing point, and repeat the pictures at one-quarter foot intervals. Keep a record of the focus for each exposure.

When you get the film back from the processor, you can examine the negatives with a magnifying glass or have enlargements made. By comparing one with another, you'll be able to see at what distance the edges become sharp.

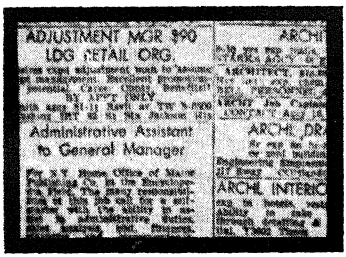
If you feel so inclined, you can run a full test at various

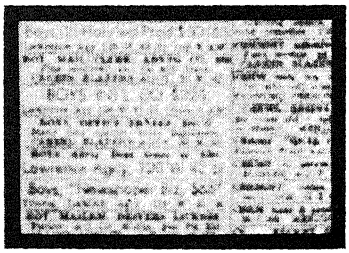


• To check field curvature, first focus single lens reflex sharply at center on double page advertising spread from a newspaper. Make sure the paper is evenly lit.

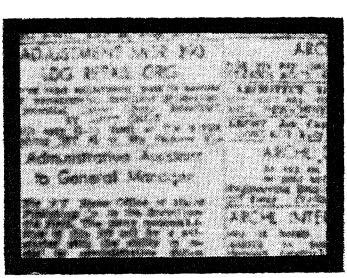


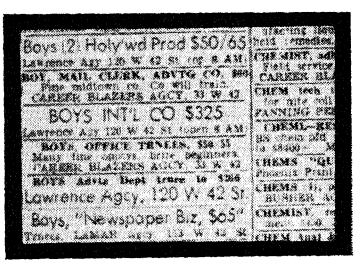
• Now focus the camera at the same distance on the edges of the focusing area instead of on the middle. Shoot another picture at the same exposure as above.





• Here's what you might think is lack of edge definition. Blowup of center portion at left above is reasonably sharp. Enlargement of edge at right is blurry.





• But look how sharp edge becomes at right above. Note that center now becomes sharp. This indicates field curvature. See Test 29 for all cameras.

apertures to see just where curvature of field is no longer a factor.

Once you know that your lens does have curvature and just how much at close focusing distances, put the information to work, aligning subject material to get the greatest sharpness when you're shooting at full aperture.

What lenses are most apt to show marked curvature of field? Superfast lenses and extreme wide-angle lenses of fairly large apertures.

Despite the nasty things we've said about lens testing in general, it can prove of great value to you if you do your own testing, if you use the same test object at all times, if your lighting remains constant, and if your developing techniques are exactly the same. And this goes for the curvature of field test, too.

CAMERA TESTS

CAMERA TESTS

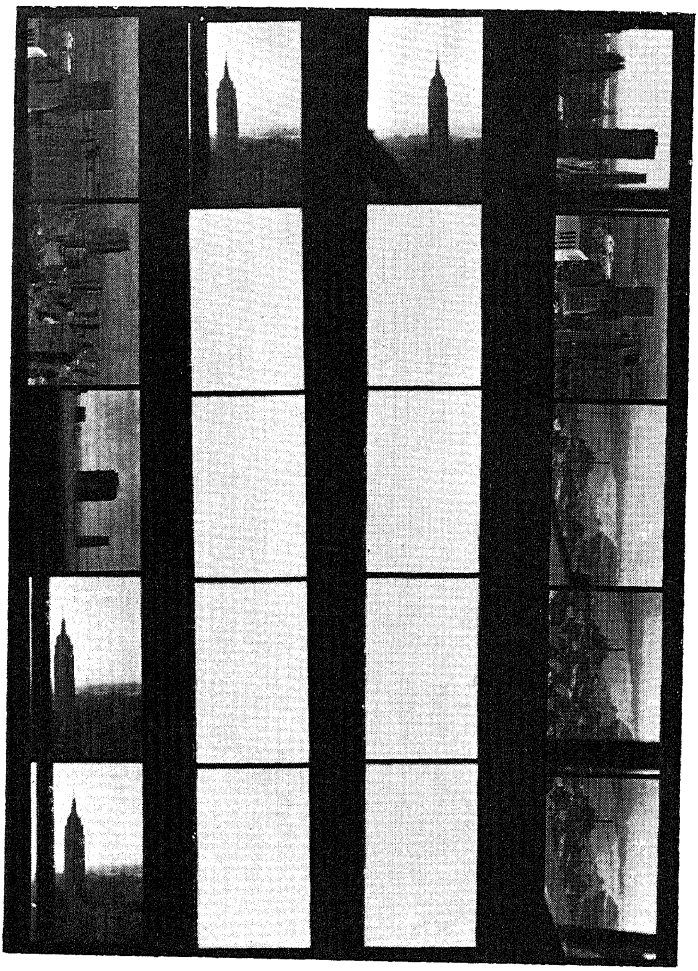
30. Ground Glass Efficiency Test

Various reflex viewing systems, whether waist level or eye level prism, vary greatly in brilliance and ease for obtaining sharp focus. The grain size of any focusing screen is actually a compromise. With coarse ground glass screens it is easy to obtain sharpness but at the cost of brilliance and ability to render fine detail. Fine ground glass screens are more difficult to bring to the exact point of sharpness since they let too many direct rays from the lens through without forming them into a focusing image on the ground glass. If the ground glass is made too fine, you will see an image of the lens aperture in the central portion. Another test of a too-fine-ground glass screen: see if there is a centrally brilliant spot. Now move your head slightly so that your eye is no longer centrally located over the ground glass. If this central spot tends to move with your eye the screen is too fine. If the screen is coarse and too dark to focus accurately, the opposite manufacturing error has been made.

31. Focal-Plane Shutter Test

To test uniformity of shutter action:

1. Make test negative at all speeds by photographing an evenly illuminated blank gray wall or card. Use a meter. Develop normally.



• If your camera and lens combination can be used to shoot a clear sky at all apertures, varying the shutter speed to keep the exposure constant, it has no lens vignetting (Test 9) and has a properly acting shutter (Test 31).

2. Assemble a flood lamp and diffusion material. The latter can be tissue paper, with a thick sheet of cardboard (¼ in. hole in center) directly behind the paper.

3. Place test film in front of the hole so one edge of the frame is directly over it. Position exposure meter about ½ in. behind the opening.

4. Adjust your flood so the meter needle rises one half of its full swing when negative is in front of the small hole.

5. Check meter reading the way you would to actually figure an exposure. If there is more than a half stop difference between the original reading and any other (f/8 to f/6.3, for instance) non-uniformity is serious and your shutter needs repair.

32. Shutter Bounce Test

A number of highly tensioned focal plane shutter cameras are susceptible to shutter bounce—at the end of their travels; instead of simply coming to rest the two focal plane shutter curtains rebound. Shutter bounce will show itself as a strip of overexposure at the end of your negative when you photograph a subject with overall even tone such as a blank wall.

33. Leaf Shutter Test

Only a good repair shop can test shutter speed accuracy. But you can run tests to check leaf shutter lag (the time shutter takes to open fully and close fully).

1. Center a 9½ in. diameter card-board circle on a 78 rpm turntable—the old fast speed. The circle should have a thin India ink center, with ⅜ in. spaces between start of lines at circumference.

2. Place the camera so it is sharply focused at 3½ ft. distance; use any shutter speed over 1/200; move flood so you can expose at least at 1/200—with maximum lens opening.

3. As turntable spins, shoot normally. Overexposure nullifies the test.

4. To read results: examine the negative with a magnifier, or on an enlarger baseboard, or have a 11 x 14 print made. The lines will be blurred.

5. At the circumference, measure distance "A" between centers of two successive blurs. Next, measure shorter distance

"B" from center of one blur to its edge. The relationship of "B" to "A" represents time lag.

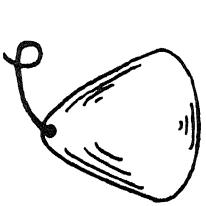
6. Resulting fraction (say, ¼) is multiplied by 1/100 (time it takes for one line to be replaced by another as table spins). The 1/400 lag (if this example) is the greatest you should allow.

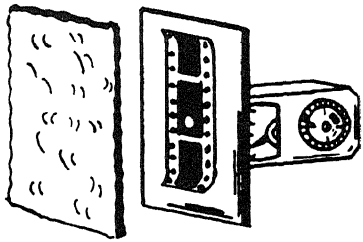
7. The shutter needs repairs if it has lag of 1/300, 1/200 etc.

34. Built-in Meter Test

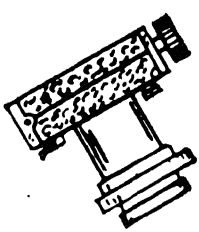
Today, some cameras with built-in meters are not as large as the separate exposure meters of a few years ago. And there is little difference in size or weight between these models and the meterless ones which went before. However, anyone who thinks that all built-in meters are the equal in versatility and sensitivity to their big separate meter brothers is addled. The built-in meters, precisely because of their size, have smaller and consequently more limited scales. Since sensitivity and possible range depend largely on the size of the meter cell, it's fairly obvious that most tiny meters can't possibly take the place of the big separate meters. However, in exhaustive tests of almost every conceivable meter, built-in or not, we have come to the conclusion that a good built-in meter will serve you well in practically every situation. Of course, some built-in meters are better than others. It's a simple problem to test the meter before you buy the camera to see whether it comes up to your needs. Basically, you are faced with two separate, although related, characteristics—sensitivity and accuracy. Some built-in meters are extremely accurate outdoors or indoors, but are not sensitive enough to register a reading under low light conditions. On the other hand, it's quite possible to find a built-in meter whose needle registers even in very dim light, but, alas, whose readings are inaccurate. Obviously, the less sensitive but more accurate meter is to be preferred. We'd suggest you first carry out a test for accuracy and then test sensitivity. A comparison test using a first class separate meter as a control is the quickest way to sort the sheep meters from the goat meters.

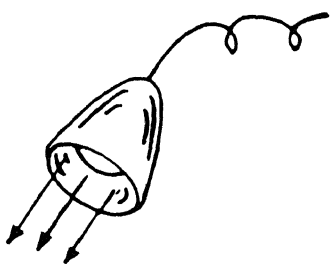
1. Borrow an accurate exposure meter from your dealer.
2. In the store, using reflected light readings only, point

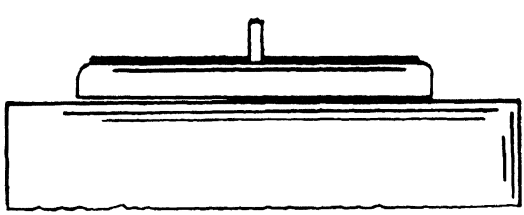




• To test uniformity of focal plane shutter, assemble flood lamp, diffusion sheet, cardboard with hole in middle, and a good exposure meter. Then follow instructions (Test 31).







• Only a good repairman can test focal plane shutter speeds, yet an old (but accurate) 78 rpm record player can help you check a leaf shutter with this setup (Test 33).

the meter at bright areas and at dim places and check the readings throughout the range.

3. Meters should register within a half stop of each other at all times.

Now let's try a test for sensitivity:

1. With the camera adjusted for manual operation (if it's an electric eye), set the calculator on the built-in exposure meter to ASA 400. Now point the camera and meter to an area where illumination is so weak that the meter needle just barely moves from the zero position.

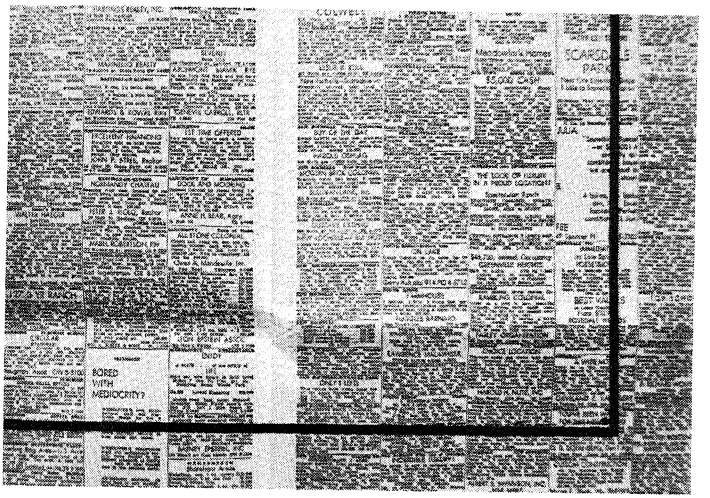
2. Line up the second pointer (if it has one) over the needle so you can read the exposure indicated.

If the aperture is f/2 or larger at the 1/30 sec. shutter speed, the meter is sensitive enough for all practical work in low light or high. An f/3.5 at 1/30 sec. reading means the meter is sensitive for bright available light work indoors. If it reads more than f/4.5 at 1/30 sec., it will do nicely in bright light indoors or practically all situations outdoors. Remember that the meter which is sensitive only outdoors may indeed be very accurate. Obviously, the degree of sensitivity which you require depends on the photographs you intend to take.

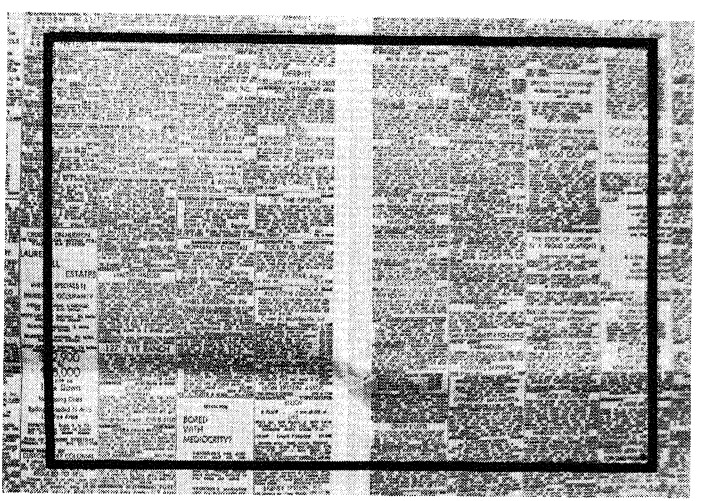
35. Viewfinder Accuracy Test

Are you getting on your film exactly the same area that you see in your viewfinder? With many of the less expensive cameras the answer is definitely "no." Even though the viewfinder is located near the taking lens it is slightly above and to the side of the lens. At normal picture taking distances this discrepancy is minute and generally does not lead to any errors. However, when shooting close at 3½ to 5 feet the so-called parallax error unless corrected, can cause the top of your picture to be cut off and some area added to the bottom.

There are three methods used on good cameras to minimize this difference in viewing area. Some direct finder cameras have parallax markings in the finder window, which indicates just how the picture area changes when you are focusing at a specified close distance. While this is better than no parallax correction at all, it is only absolutely correct at one specific camera-to-subject distance. The automatic parallax correcting viewfinders are better. Here the viewing area outline automatically moves as you focus, always indicating the actual



• Are you getting what you see through your viewfinder? Outline area seen on newspaper spread with heavy markings. Shoot picture. This indicates parallax error (Test 35).



• If your negative shows outline of finder well within area, your camera is recording more than the finder shows—a crude form of parallax correction (Test 35).

picture area. There is another so-called correction which doesn't correct at all but is a subterfuge. In some cameras, the finder area deliberately shows less than will actually appear on the negative or transparency. While this does in effect eliminate parallax error by always producing the area seen in the finder, a great deal of extra area not seen in the finder is also reproduced. If you are shooting color and have been careful to eliminate some particular distracting object, you may find it rather disconcerting to find this object right back on the transparency. This can and does happen when the viewing area is reduced in size.

A single lens reflex camera manufactured to the highest specifications should give you complete finder accuracy, since you are in effect viewing through the taking lens of the camera.

Actually, all the listed parallax correcting systems are subject to error. Parallax markings prove inaccurate, automatic parallax correcting lines don't correct properly, and few single lens reflexes show the precise area that they should. A simple test will quickly indicate if your viewfinder disagrees with your lens and just how much.

1. Tape on your wall a double page newspaper spread of the classified ad section. Light the spread evenly.
2. Place your camera, loaded with film, on a tripod and focus it to its closest focusing distance.
3. Move in on the paper until it is sharp.
4. Glance through your finder and note the words, letters or groups of words which appear at the four corners.
5. With a ruler and heavy crayon pencil connect these four corners, so you have outlined the picture area as you see it through the finder.
6. Shoot a picture at the proper exposure.

On the processed negative you will be able to see immediately just how much extra picture area, if any, is actually being reproduced. If the finder is showing an off center picture, the outlined area will appear off center in the negative area. If the finder is showing more than the picture area (this is rare), you will not see the outline at all, and on closer inspection with a 10X magnifying glass you'll note that the letters or words you saw originally in the finder don't appear at all in the picture and neither do the lines you drew.

One word of warning! Never examine a print or a mounted

transparency to compare finder area with actual picture area. Most prints do not show the entire negative area, since some of the area is automatically lopped off in the printing machine or under the easel border. Always look at the negative. Transparencies lose a slight amount of area when they are mounted. To examine their areas properly you must take the transparancies from the mounts. If you have an extremely accurate camera viewfinder system, it may pay you to include a little extra space around your picture area to allow for print or transparency masking.

36. Automatic Diaphragm Test

We once believed that a lens set at f/4 or f/8 always produced an exposure at that aperture. However, we have noted that automatic diaphragm lenses on single lens reflex cameras —particularly those which close right before the picture and reopen immediately afterward—are more delicate than most diaphragms. After periods of inactivity, cold weather, or improper manufacture or due to just plain tiredness, such diaphragm blades may not close to the proper aperture. Instead they may close to a larger-than-proper opening and remain

• Is your single lens reflex automatic diaphragm really giving you the right lens opening, or is it sticking without your knowing it? (Test 36).

there, thus producing an over-exposure which may have you, quite understandably, stumped. If you have a single lens reflex with an automatic diaphragm and have been getting an occasional gross or even slight overexposure of a few frames try these tests:

1. Test the automatic diaphragm visually. Turn the camera towards you and watch the diaphragm aperture blades open and close as you press the shutter release. Start at the widest aperture and proceed to the smallest. Of course each succeeding exposure should show a smaller and smaller aperture.

2. Try the procedure in reverse beginning with the smallest opening and proceeding to the largest. Press the release very gently. That's when diaphragm blade sticking appears most often.

3. If you are not too certain of your eye test, better do a test on film. Shoot a series of pictures of an evenly lit blank wall

• How much jar is the bouncing mirror really causing? Place camera on foam rubber block (Test 37).

at all apertures varying shutter speeds to keep the exposure constant. The resulting negatives should all have equal density. If you're sure that your shutter speeds are O.K. (see Tests 31, 33), the diaphragm is at fault.

Incidentally, should an automatic diaphragm stick at some apertures after long camera disuse, don't blame the camera. It's primarily your fault. Like all operative mechanical instruments, no use is as bad as overuse. Even if you don't intend to take pictures weekly, give your camera a workout at all shutter speeds and apertures at least once a month to "stretch its legs."

37. Shutter or Mirror Jar Test

Unsharp pictures are often thought of as caused by the jar of the shutter action. Many single lens reflex cameras with rapid return mirrors do seem to "jump" in your hands during exposure. Tests have shown that the majority of photographers reporting such phenomena as actually affecting their pictures simply were unable to hold their cameras steady. The shutter or mirror action merely provides them with a good excuse for unsharp pictures. The apparent physical jar that many photographers feel generally occurs when the shutter closes or the mirror returns to the down position. In such cases it would be impossible for the action to cause any deterioration of image quality, since the shutter has already closed before it occurs. However, here are two tests you can make, one physical, the other a picture-taking test, to make sure jar is not affecting your pictures. For the physical test:

1. Set your camera on bulb or time and press the shutter release.

2. Did you feel the same jar in releasing the camera at bulb as you did at a faster speed? If you did, there is a chance that shutter or mirror jar caused it.

3. If you felt nothing, the cause of unsharpness lies elsewhere.

If you have already tested your camera and lens for quality and alignment, try Test 50 to determine hand-shake at various shutter speeds.

If there did seem to be a slight shake when the shutter was released at bulb or you still feel that camera movement caused by shutter or mirror action is present, perform this test.

1. Obtain a block of fairly soft sponge or foam rubber. Place the block on a firm support such as a table.

2. Place your camera (loaded with a fine grain film) on the block, aimed at a suitable target such as a newspaper classified ad tacked flat to a wall.

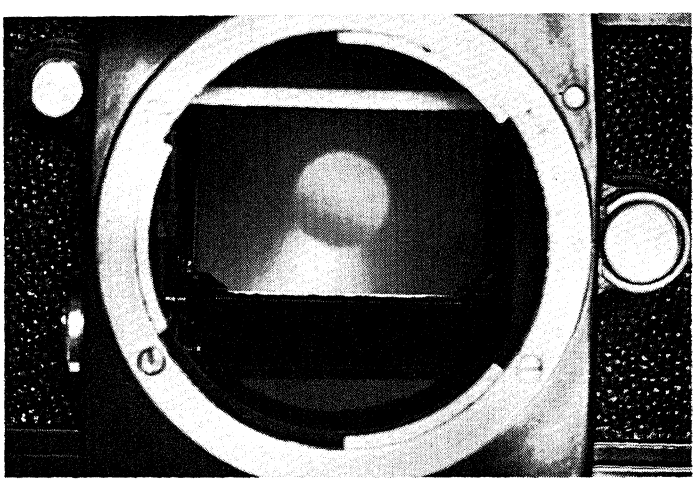
3. Light the paper evenly and make a careful exposure meter reading.

4. Keep the exposure constant by varying aperture, and make a series of photographs of the newspaper spread at all shutter speeds from the slowest to the fastest. Re-do test three times.

5. After development examine each negative carefully with a 10X or more powerful magnifier.

All negatives will be equally sharp if there is no jar caused by shutter or mirror action.

However, you may notice a marked deterioration in sharpness at speeds slower than 1/30 sec. This is quite natural, since the cameras should not be used at such speeds for best results unless secured to a sturdy tripod. If, however, there is a marked lack of detail in the picture made at 1/30 sec. when compared with that made at 1/500 sec., it does indicate



• Reflex camera mirror is delicate, position is precise. Check front surface coating (Test 38), camera alignment (Test 1), and mirror jar (Test 37).

that the camera itself may be at fault at such speeds. You may be able to minimize this jar if you have a steady hand (see Hand Steadiness Test, 50). But if your hand-shake test indicates that you do have a tendency to hold cameras unsteadily at moderately slow speeds (1/30 to 1/125 sec.), then the camera's own jar will only aggravate this condition and a greater overall loss of sharpness will probably occur.

38. Front Surface Mirror Test

Most reflex cameras have reflecting mirrors that are coated on the surface atop the glass instead of on the bottom below the glass. A few large reflexes such as the Graflex had rear surface mirrors. Front surface mirrors are, of course, very delicate and a slight scratch or fingerprint can ruin them. And they cannot be cleaned as easily as a rear coated mirror. A damaged mirror should be replaced with another of like construction. If it is not, the focus of the camera can be measurably affected. If your camera doesn't seem to focus on the right plane (see Test 1) do this:

1. For a camera with a removable lens: Remove the lens and examine the mirror. By glancing at it from an angle you can easily detect whether the coating is above or below the glass. If the coating is below, there's a good chance that the mirror is the cause of your focusing difficulties. Check with a repairman to make certain that the proper mirror has been fitted.
2. For a camera with a mirror that is mounted in such a way that you can't get at it: Don't try to disassemble the camera yourself. Take it to a repairman and have him check the mirror.

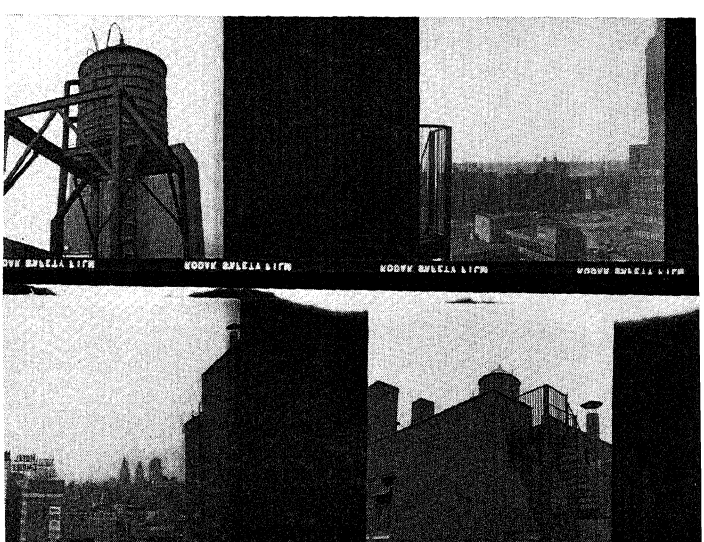
Incidentally, often a reflex camera will seem to give a rather dim, fuzzy image on the ground glass. Check to see that the mirror surface is clean and bright. Mirrors do age and need replacement.

39. Film Scratch Test

Are you getting those tiny thin narrow scratches running the length of your film? You may not notice them in transparencies but they're bound to show up on black-and-white prints of any size. Many years ago these scratches were merely con-

sidered the unhappy lot of those who switched to such a tiny, ridiculous size as 35mm. Today there is no excuse for such scratches even with inexpensive cameras.

Where do these scratches come from? In rare instances they can be traced back to film manufacturer. More often, when the film is at fault in 35mm cartridges, they are caused by a small bead of glue which attaches the felt light trap lip to the edge of the cartridge opening. This tiny bead acts as a knife cutting a thin line right across the film as it travels from the cartridge during shooting and then back again during rewinding. It's quite simple to test for the source of the trouble—cartridge, film or camera. If the scratch appears on only the film and not on subsequent films of the same type, it's the individual film or cartridge and you have nothing to worry about as far as your camera is concerned. However, should the scratches persist in other rolls of film, place one roll or negative over the other, hold them up to the light. The camera is at fault when the scratch lines coincide. You may find that the scratches appear only when certain brands or types of film are loaded. Don't blame the film. It is the camera. Today's films vary vastly in thickness. A thin based film may slide easily through your



• Examine strips of roll film and note spacing between shots. If it's uneven, there may be mechanical trouble (Test 40).

camera. One of the thicker films which has less clearance may, on the other hand, catch whatever it is that's causing the scratch. That's why you must make the camera test with at least two rolls of the same type of film.

If the scratch appears on the print as a white line, the cause is very probably a minor one, most likely on the base side of the film. It means that the cause of the scratch has not completely penetrated through the emulsion layer. These scratches, incidentally, can be eliminated on the prints with some careful spotting work. Use a medium such as Spotone.

The trouble is more acute when the scratch causes a black line on the print. This indicates that the obstruction is enough to cause a complete penetration of the emulsion which lets through straight light from the enlarger and makes the black line. What is called for here, obviously is a careful examination of the inside of the camera. Use the scratched negative as a locating template. Over-enthusiastically powerful pressure plates were once a source of trouble. However, modern camera construction with its film channel has largely eliminated this. But check it anyway. A repairman should be sought, whatever the damage.

A final word of warning. Don't overlook the film processor as a cause of the scratches. If the scratches occur more than occasionally but in different places change processors since today film just isn't that poorly packed. Also be careful of so called strip negative carriers of enlargers which supposedly allow you to slide film through without removing the carrier from the enlarger and opening it. They too can scratch film easily. Always take the carrier out, slide the film through and replace the carrier. Lastly, store your roll of 35mm film flat in strips. Don't roll the negatives up and keep them in a tube. A tiny grain of dust between layers can cause an unhappy scratch of less than full length. You can pin down the cause by noting the type of scratch. If it does not run the length of the film and does a bit of wiggling, improper negative handling is to blame.

40. Roll Film Spacing Test

If you've ever owned a roll film camera, you may have never given a second thought to the particular mechanism which counts the pictures for you and stops your film wind auto-

matically at the proper blank stretch of film. In the old days, there was no reason to think twice about it. When you lined up the right number in the ruby window on the bottom or rear of your camera, the film was set right. However, as film wind became more automatic certain mechanisms were designed to do this job precisely with no need for the camera owner to glance at the camera while winding. If you buy a roll film camera, make sure this mechanism is operating properly. Run a roll of film through the camera. The test roll you're using to make some other necessary tests—alignment or lens test, for instance—will do. When the film is processed, examine the whole length. Don't let the processor cut the film until you see it. Is there irregular spacing between picture areas. If there is, reject that camera. The condition will no doubt get worse. If you find this happening in a camera you now own, better take it to a repair shop.

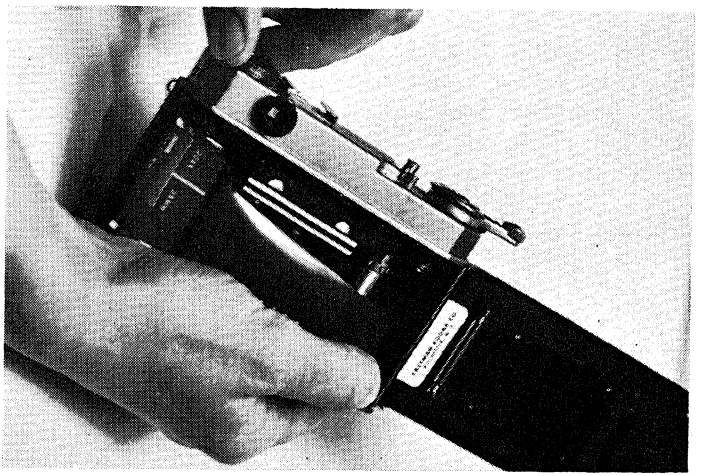
41. Pressure Plate Efficiency Test

While the trouble with most pressure plates is that they press too strongly against the film and cause some scratching, the opposite also may be true—insufficient pressure may be causing the film to lie unflat and not tight against the film plane of the camera. You needn't actually make a test for this. You can simply examine a negative or strip of negatives made with the camera. Examine the edge of the picture frame with a moderate power magnifying glass (about 10X). If the film is being held properly flat the edge will be clearly defined. If the film is not being held properly flat the edge will be slightly fuzzy. Make sure you examine the entire perimeter of the negative area, since the film may be held properly at most points but improperly at one or more other points.

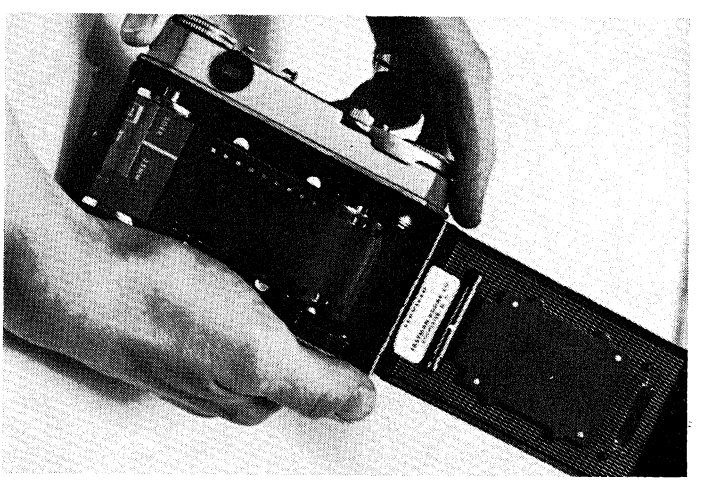
42. Take-Up Spool Efficiency Test

Nothing seems to vary in 35mm camera design as much as the take-up spools and the systems by which they hold the end of the film leader. Some do a better job than others, some do too good a job.

1. Following the manufacturer's instructions, secure the film leader to the take-up spool.



• Some 35mm cameras won't load properly unless entire film rests on sprocket wheels. To test, fasten slim leader, close camera back and see if dummy film advances.



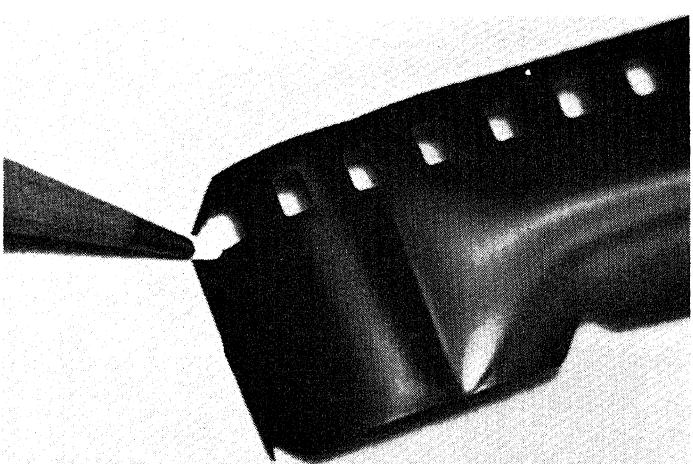
• If leader alone won't pull film, roll on entire width and check whether sprockets pulling both sets of sprocket holes will do. If not, consult repairman (Test 42).

2. With the back of the camera still open, revolve the take-up spool to tighten the film leader and bring the sproket holes down over the sprocket wheels.

3. Tighten the film within the cartridge by turning the rewind knob or lever until the film across the film plane becomes taut.

4. Hold the rewind knob or lever, then attempt to wind the film with gentle force by turning the advance knob or lever and pressing the shutter release if necessary. The film should not slip from the take-up spool.

5. Release the rewind knob and advance the film using your thumb to press the film gently against the film plane like a pressure plate. The film should advance with no trouble. If it does not, advance sufficient film manually so that the leader is almost completely wound around the take-up spool and the entire width of the film covers the sprocket wheels. Now try advancing the film. Many cameras simply will not advance film unless both sprocket wheels, top and bottom, are covered. With such cameras be sure the film is advanced to this point before closing the back, or you may find you haven't taken the 20 to 36 exposures you think you have.



• Some 35mm takeup spools won't let go of leader. Film chips indicated by torn perforations can get into shutter mechanism. Check leader perforations (Test 42).

6. Close the camera back and shoot the roll of film.

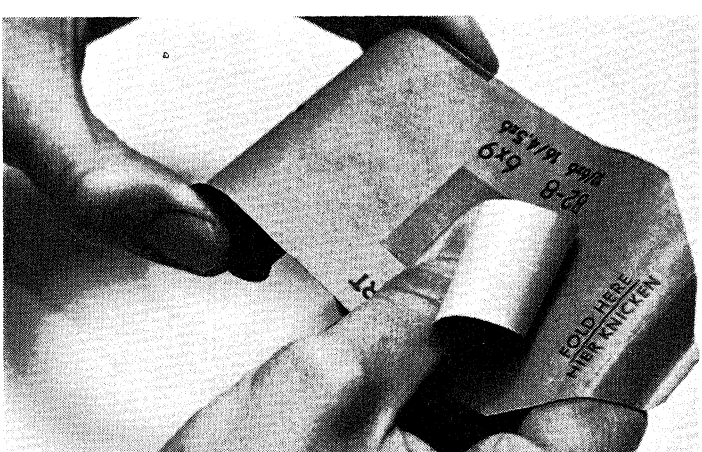
7. Rewind the film slowly and gently hold the camera to your ear to hear the end of the film being released from the take-up spool.

8. When the film is released, there may be a slight amount of extra effort required on the rewind knob or lever, but no great resistance should be felt.

9. Take the film from the camera and examine the sprocket holes, or the film edge that was held by the teeth or clip of the take-up spool. The film should not be torn and the sprocket holes should be perfect. If either seems even slightly ripped, there's a chance that the spool may be depositing tiny slivers of film within the camera with every roll of film shot. These can jam up the works. Have the spool repaired.

43. Loose Roll Film Wind Test

Many good pictures are accidentally fogged because the roll film camera in which they were taken doesn't wind the film tightly enough. While taking out the film, light enters the roll of film around the edges between the film spool and the paper backing. The test for proper film wind tightness follows.



• Are you getting fog along the edges of your roll film negatives or color transparencies? The camera may not be rolling the film tightly enough (Test 43).

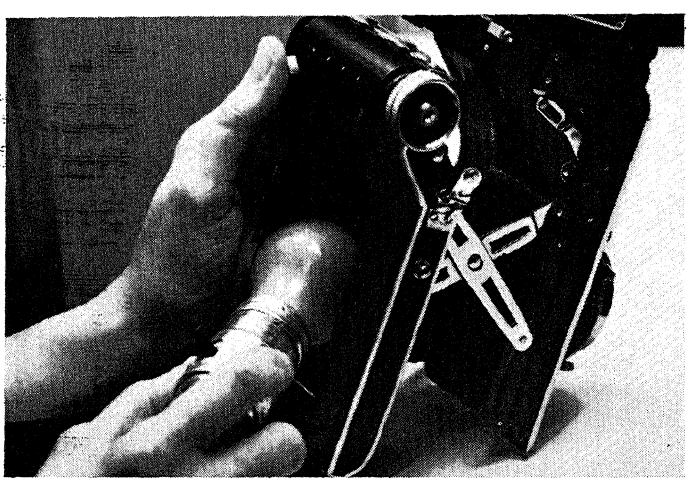
1. After winding a roll of film through your camera, remove it carefully making sure that the end doesn't slip.

2. Hold the spool by the ends, between thumb and index finger, then grab the end of the paper leader and attempt to roll the film without allowing the spool to rotate. If you are able to tighten the film appreciably, the camera is not winding film tightly enough and should be taken to a competent repairman.

44. Bellows Safety Test

Although fewer and fewer modern small cameras use leather collapsible bellows, these are still standard on larger cameras, and many of the smaller folding cameras are available on the used market. Bellows are subject to mildew, to the action of insects and to the tolls of old age, all or any of which can cause light leakage.

While light leakage in terms of large areas can easily be seen, the tiny pinholes which sometimes form inside the folds of the bellows produce a far more difficult defect to detect. Often a photographer hardly realizes they exist, so subtlely do



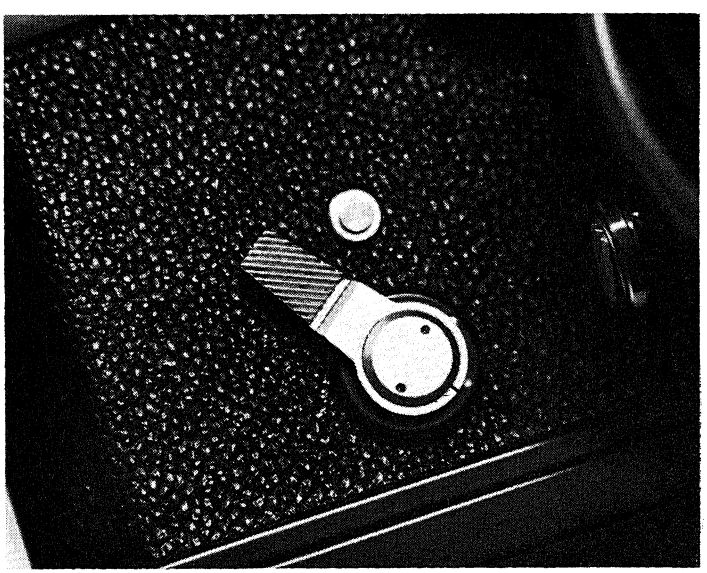
• Does your camera have bellows? If so, better inspect occasionally for pinholes which can fog your pictures. Open bellows and insert a bare lightbulb (Test 44).

the pinholes degrade the images produced on film within the camera. Any photographer with a bellows camera should perform the following test periodically.

1. Place a small electric light bulk without shade in an electric light socket on an extension cord.
2. In a darkened room, open the back of the camera and with the shutter closed insert the bulb from the rear into the bellows opening.
3. Turn on the bulb light and smooth out the folds of the bellows with your fingers. Any light leaks that are now detectable through the bellows must be fixed before the camera can be considered safe for photography.

45. Self Timer Test

It's been our experience, even with the most expensive cameras, that the feature which most often breaks first or fails to operate properly is the self timer. This is no great loss in most picture taking, particularly if you know about it before-



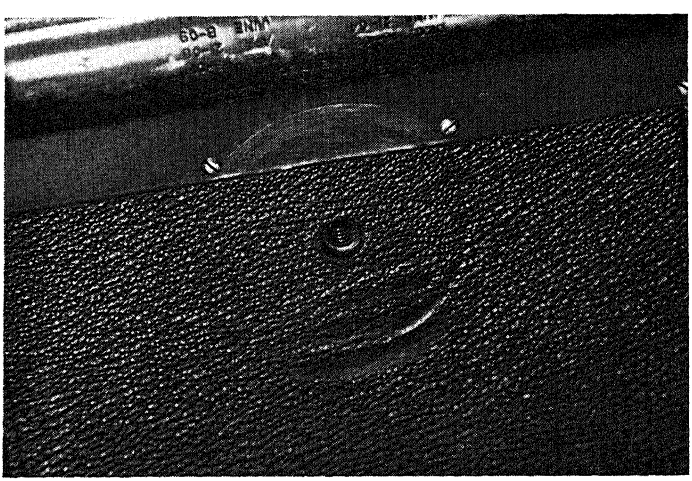
• It's supposed to be a 12-second self timer. Is it actually working on 8 seconds? A test to find out is simple (Test 45).

hand and use an accessory unit which threads into your cable release, if and when a self timer is needed. Most people don't like to have a gadget on a camera that's not working—even if they don't use it. A self timer test is simple.

1. Try the timer out every week or so even if you plan to use it or not.
2. If the timer has intermediate settings, check it at these also.
3. Match the self timer against the second hand on a watch. Many self timers have a poor sense of time keeping and 10 sec. one day may be 12 the next. Do you plan to use the self timer to get into your own picture? A behind-schedule timer may set the camera off while you are in the act of racing to get in front of the lens.

46. Bare Camera Wear Test

A camera that's only been used by "an old lady and never driven over 30 miles an hour" is obviously a fine purchase. It's not always easy to tell whether the camera really had such an owner. Many cameras, even those having hard use, can



• Has the used camera you're thinking of buying been subjected to hard wear? One tell-tale indication is the tripod socket. Circular rings indicate it's experienced heavy use (Test 46).

be disguised with artistic enamel work and leather renewer. Here are two wear points to test:

1. Examine the tripod socket carefully. Most cameras used heavily by ardent amateurs or professionals will show some wear around the tripod socket. This wear will consist either of scratches around the socket indicating that, as with all photographers, the owner had some trouble locating the tripod socket and was slightly careless in fitting the camera to a tripod. Cameras that have been fastened to tripods too securely or cameras that have been twisted on the tripod to tighten them will show circular rings around the tripod socket.

2. Most professionals and many advanced amateurs do not use camera cases but prefer instead to carry their cameras bare, hanging them around their necks or shoulders by neck straps attached to the eyelets at the sides of the camera. Check the chrome or enamel on the camera body carefully for scratches indicating that the snaphooks of the carrying strap have rubbed against the body. If you use such a carrying system yourself, prevent these scratches by covering with photographic masking tape those parts of the body which may come into contact with the snap hooks.

The results of the two previous tests should not stop you from purchasing a used camera. They merely indicate the amount of wear and care that a camera has had and may help you in determining a fair purchase price.

47. Butchered Camera Test

Many cameras land in the hands of photographers who never rest until they take the camera apart to see what makes it work. Many owners can't resist the temptation of attempting repairs on a camera whenever they think something has gone wrong. Luckily, it's fairly easy to find out if a used camera had formerly belonged to a "do-it-yourself" repairman.

1. Check the slits in the tiny screws which hold the various front, top, side and rear plates of the camera together. The slits should be perfect and show no signs of being forced or enlarged with pressure or improper tools. The professional repairman has just the right tools to prevent damage. Home workers are liable to have a go at the camera with a pen knife. In addition, when a professional repairman works on a camera

and damages a screw slightly he replaces it with a new one during reassembly. A home butcher does not.

2. Examine the leather or artificial leather covering of the camera carefully. Many of the screws holding the camera parts together are located under the leather. Inquisitive camera owners will quickly discover this and may attempt to pry the covering off to get at the screws. Most tinkerers do not know, however, that the adhesive used to fasten the leather or artificial leather to the metal is an adhesive similar to rubber cement. Such an adhesive allows the covering to be peeled back for repairs and the covering is replaced with no damage. If you pry a tiny corner of covering from the camera and it refuses to come, chances are that an owner along the way has used some stronger bonding agent which will make repairs in the future quite precarious since it will be impossible to peel the leather back without damaging the camera.

48. Camera Origin Test

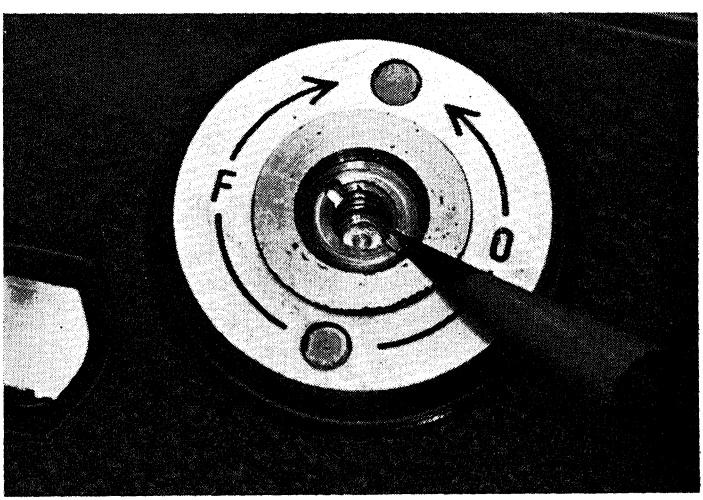
Was your camera or lens made for the American or the foreign market? As far as picture taking ability is concerned, this point may have little meaning. However, if ever you intend to trade your camera in, it will bring less if it was made primarily for overseas marketing. You can tell one from the other rather easily. If the camera does not have interchangeable lenses, look at the focusing mount. You are safe if this is marked in feet only. You are also safe if it is marked in both feet and meters. But if the mount is marked in meters only, it is a foreign aimed camera.

You can be fooled, however, if it has interchangeable lenses. The camera lens can be marked in feet yet the body itself made for foreign sale. The telltale item is the tripod socket. If it has the standard American thread and will fit the average tripod in the camera store, it's a U.S. sales item. If it has a larger thread, it's a European or Japanese marketed camera. Be on the look out, too, for adapter bushings which convert European threads into American. These bushings are like screws with regular screw threads and screw driver slotted heads. They simply screw into the larger European thread and furnish the camera with an interior American thread. Again, remember that this in no way affects camera quality or ability, just resale value.

49. Camera Case Test

Will your camera case really protect your camera from damage? Almost any case will protect a camera against dust and dirt. But suppose the camera in its case hits the edge of a table, the wall, or is dropped on the floor? Will the case offer substantial protection? Most soft leather cases do not. Many hard leather cases, both the eveready and gadget bag types, offer less protection than they should. To test a case, place the camera in its eveready case or all the equipment you intend to carry in a gadget bag. With your fingers attempt to flex the leather or other material around the camera to see if you can feel any of the camera edges. Lens mounts are particularly vulnerable. If the leather does flex enough for you to feel the edges, you can be sure that the case will not protect the camera or other equipment against collision.

Remember that no gadget bag will protect what is inside it unless the bag is loaded properly and all internal equipment is kept from rattling around. Sponge rubber makes good stuffing and cushioning material.



• Has the tripod socket a screw type adapter? If so, camera may have been made for the European market (Test 48).

50. Hand Steadiness Test

Are you getting pictures you feel are unsharp—and blaming them on the camera? You could be at fault rather than the instrument. Truthfully, no one can hand-hold a camera at moderately fast or slow speeds as steadily as can a tripod. The tripod shot will always be visually superior in terms of overall sharpness to the hand-held shot if you make sufficient enlargements of both pictures. For most photographic purposes, however, hand-held shots of 1/30 sec. or faster can be made that will be fairly free from shake.

People vary in their ability to hold a camera steady. Young people are naturally more steady than older; practiced photographers are superior to the average snapshooter; photographers using a good firm stance with the camera braced against the body or an eyebrow are steadier than the off-hand snapshooter. In addition, sharpness depends on your breath control. Obviously a picture made at a slow or moderately slow shutter speed may incline to blur if you are inhaling or exhaling at the moment you take the picture. Lastly, many photographers do have an unconscious habit of jarring the camera by pressing too firmly and too quickly on the shutter release itself. A camera must be aimed and shot like a rifle. The various factors that produce poor rifle aim also produce camera shake. A camera held and operated as a rifle will definitely produce superior pictures.

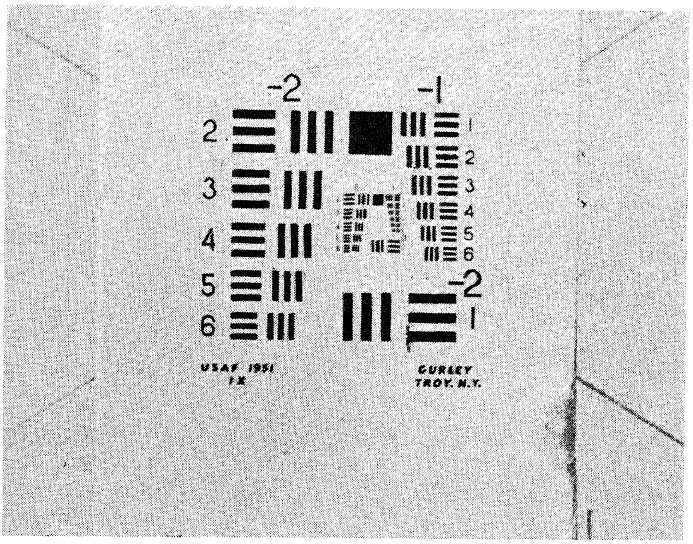
Let's suppose you have done everything possible to eliminate or minimize camera shake. How can you make definitive tests to show yourself just how slow a shutter speed you can hand-hold safely?

1. With a suitable target such as the classified advertising section spread of a newspaper taped to a wall and lit evenly, make an exposure with a tripod at a reasonably fast shutter speed of 1/100,1/250 sec. or higher.

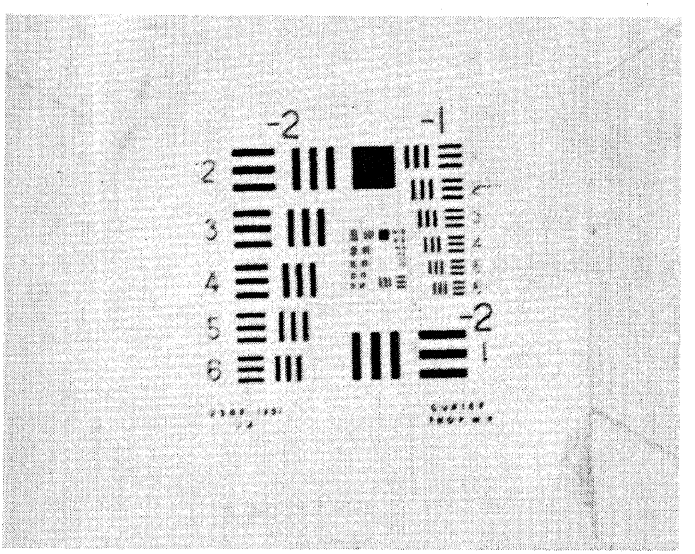
2. Remove the tripod, and from the same camera position make a series of hand-held pictures at all shutter speeds while varying lens aperture to keep your exposure constant. Use every trick in the book that you know to maintain full steadiness yourself.

3. Have the film processed and compare the tripod shots with your hand-held efforts.

If you've marked each shutter speed as you've shot it, you



- Put camera on tripod and shoot test chart such as this.



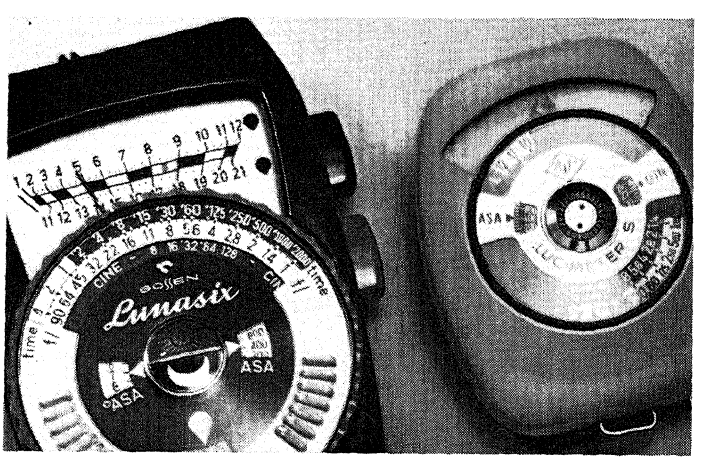
- Now hand hold camera at various speeds varying lens aperture to keep exposure constant. Check blur (Test 50).

can easily see the point at which sharpness begins to deteriorate. Just examine the fine classified ad print with a 10X or more magnifier.

Careful tests show that the average photographer can handhold an exposure of 1/30 sec. reasonably well and these pictures will allow moderate enlargement to 8 x 10. At slower speeds few photographers can develop sufficient steadiness without considerable practice. But before you pat yourself on the back in case you've come out at the head of your class in this test, remember that these are the results you get when you are specifically concentrating on achieving the best steadiness control. Under actual shooting conditions, a certain additional amount of unsteadiness is bound to occur.

51. Exposure Meter Test

Reliance on your exposure meter pays off in properly exposed negatives—most of the time. Although meters are usually manufactured under fairly rigid production standards, misfortunes can happen to your meter when you start using it. Meters get kicked, dropped, bombarded with sand—and worse. Even the most lovingly protected meter can fall vic-



• Meter accuracy can be tested on elaborate electronic devices or simply by comparing readings with other meters. Readings should be within ½ stop (Test 51).

tim to attrition of one kind or other. And you won't realize it until one day "perfectly exposed" negatives show consistent under or overexposure for no apparent reason.

However, the fault may not be with the meter alone. It may be the camera. Actual shutter speeds can vary considerably from the numbers you select on the speed control ring.

Here are some things you can do to check the accuracy of both camera and meter:

1. Check the zero setting on your meter. When your hand is over the light baffle, the needle should read zero. If it doesn't adjust the zero setting.

2. Load your camera with a slow color film such as Kodachrome. Take light readings properly exposing the film at proper shutter speed and f-number combinations. If the quality isn't constant there may be something wrong with the camera. If you're not sure about the quality, take your camera to the repair shop for a shutter speed check. If the shutter is O.K., have the repairman test the meter.

3. The needle of your meter may not be moving freely. Aim cell at light and cover and uncover baffle (if there is one) several times. The needle should move smoothly to zero and back.

4. Make the smoothness test in low light, too, where the needle barely moves away from zero. Even the slightest swing should be smooth.

5. You can make a quick-incident light meter test between 11 A.M. and 1 P.M. in temperate zones (when fairly consistent sunlight may be expected). Set the meter at an ASA exposure index of 10 and hold the cell vertically so that sunlight falls directly on it. The exposure reading should be 1/50 sec. between f/5.6 and f/8.

6. Some manufacturers supply test cards that help determine if a meter is working properly. If you use a test card, the test should be made under average light conditions, not where there is snow, at beaches or near open water.

7. You can also check your meter against one or more meters of known accuracy. Take readings with all meters on the same subject and in the same manner.

8. Don't try to fix an inaccurate meter yourself. While meters are relatively simple devices, they won't stand inexperienced tinkering. Send the meter to the manufacturer or to a recognized camera technician.

The newer meters using cadmium sulfide cells rather than the selinium operate with small dime-sized mercury batteries. While these meters must be given the usual checks for accuracy, the cause may often be a rapidly dying battery (mercury batteries die quickly, not like the ordinary flashlight batteries). Some meters have automatic checking devices which give you an indication of battery fitness instantly. But many don't. If you have grave doubts as to battery life but have a meter without a checking device, point the meter at an average light source which will cause the needle to swing about half way up the scale. Keep the unit operating by continuing to press the operating level or button. If the battery is on the way out, the needle will slowly start a return to zero even if the light is constant.

PROJECTOR AND ENLARGER TESTS

PROJECTOR AND ENLARGER TESTS

52. Slide Projector Lens Test

Once upon a time it was a fairly simple, swift matter to test a slide projector. You tested it for heat, for evenness of illumination, and for sharpness. That was all. There were no such complications as automatic advance, remote control, reverse, special types of slide trays, unjamming mechanisms, and power driven focusing. While the most important tests are those first stated, the others must also now be taken into consideration when purchasing a slide projector.

Either at the store (many have facilities for demonstrating projectors) or at home (be sure you have a 10-day money-back guarantee), line up the projector perpendicular to a screen if possible, a matte screen (low reflectivity, smooth surface). Now you're ready to test the following working parts:

1. Use a slide that you know is sharp, with straight vertical and horizontal lines (a city-scape is good; if you don't have one, shoot one), or a focusing slide mounted in glass where possible, to keep it flat.

2. Check the image for sharpness—lines should be sharp all the way along and show no color fringes (rainbows) at any point.

3. Look along the edges of buildings for signs of curvature not apparent in slide (distortion). As you are inspecting the

image you can also test the focusing mechanism for ease and smoothness of operation.

53. Slide Projector Illumination Test

1. Insert slide, focus, and substitute empty slide mount of same size.
2. Check light on screen at center and at edges, visually and with exposure meter (incident type preferable).
3. Keep meter at constant angle to screen and, if using reflected type, watch out for shadow. ASA standards say corners should be at least 65% as bright as center.

Heat Test

1. Leave projector on for length of an average slide show (45 to 60 min).
2. After 15 min. insert slide (one you don't want) in gate for 2 min. to see if it buckles (base becomes distorted).
3. Gate area itself should not become unbearably hot to touch. Lamphouse should be hot but touchable at the end of test.
4. Note the escape route of the hot air. It shouldn't be toward your face or hands.

54. Slide Projector Jamming Test

1. Bend, wrinkle and crush a cardboard slide mount into unusable shape; straighten it; put it in the tray with good slides; start the projector, and see if it jams.
2. Check how easy it is to get out, if it does jam.

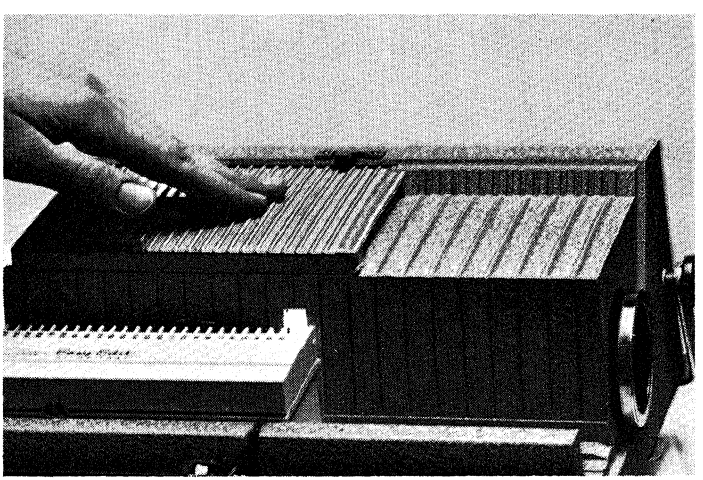
Miscellaneous operations to check during test: noise level: should not be annoyingly high or drown out narration. Light tightness: look for distracting streaks coming from the projector. And since you're dealing with an automatic machine, give all the controls—advance forward and backward, automatic focusing (if the machine has it), and the recycling timer —the works. Try pressing the wrong buttons at the wrong time. Do your damnedest to jam the machine before you get it home.

55. Enlarger Film Flatness Test

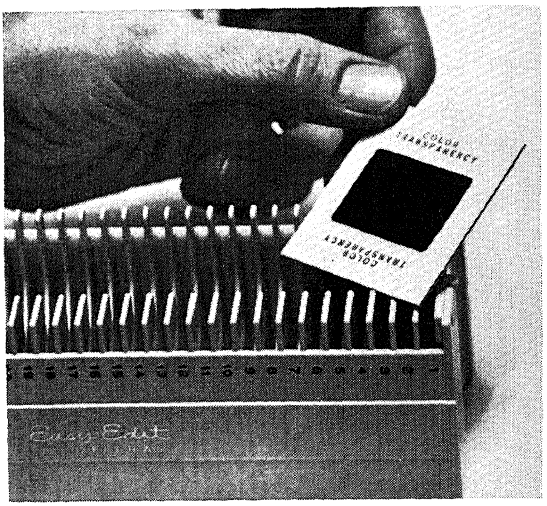
There was once a time when no one thought much of the tiresome job of cleaning the four surfaces of two sheets of glass plus the negative. In those days all enlargers featured glass carriers. You sandwiched the negative between two pieces of glass—along with a certain amount of dust or dirt and made your print. The two pieces of glass clamped firmly together did hold those negatives flat. Getting a clean print for a 35mm or 2¼ x 2¼ negative, however, was very difficult. There were the dust spots. Then came the glassless negative carrier. Practically all popular enlargers for small sizes of film up to 4 x 5 have glassless carriers.

What holds the vast area of the negative flat in a glassless carrier? Absolutely nothing. Therefore, it isn't too strange that negatives may buckle before or during enlargement when the heat from the enlarging bulb gets to them. You can make a simple test for a bad glassless carrier.

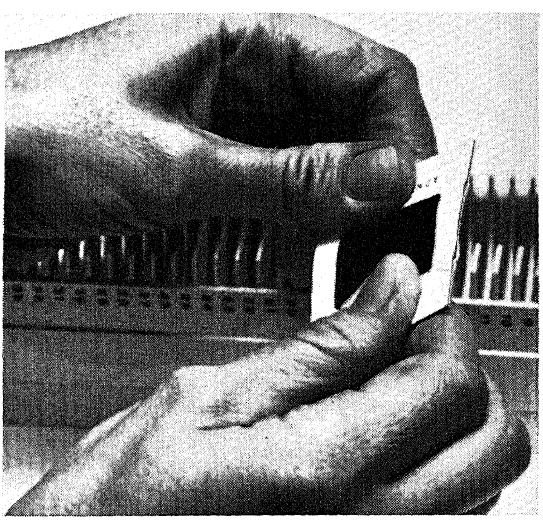
1. Obtain two pieces of good optical glass. Sandwich a test



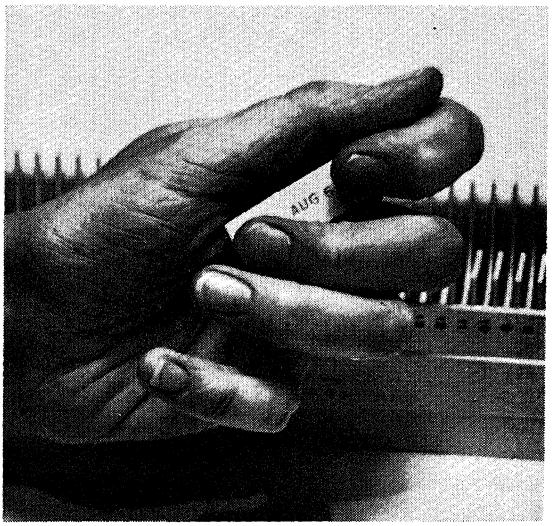
• Do you have a cool running projector or will it burn up your color slides? The heat at the lamphouse is a dead giveaway (Test 53).



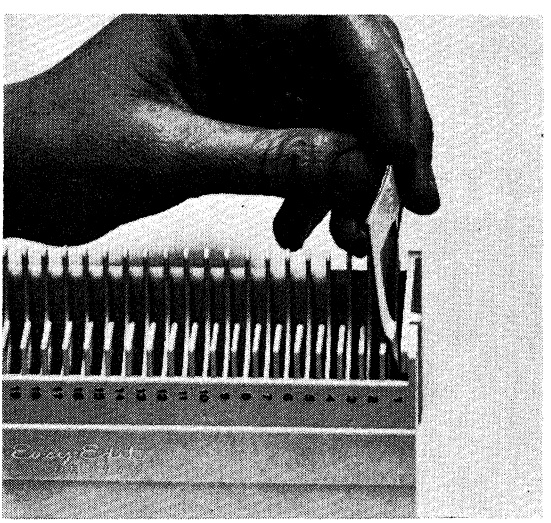
• 1. To test a projector for ability to withstand jamming, select a slide you don't want and don't mind destroying.



• 3. Straighten out cardboard into its original shape as best you can. It should still look fairly sad.



• 2. Crumple the slide completely in your hand. Don't be delicate, give it a good squeeze.



• 4. Insert slide in magazine or projector and run through. If it jams, how easy is it to unjam? (Test 54).

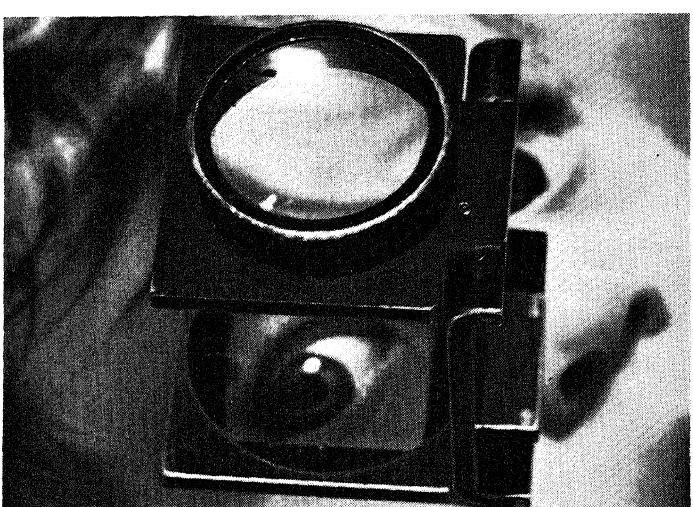
film you know to be sharp between them and place in the enlarger.

2. Make an enlargement at a reasonable aperture—f/5.6 to f/8. Repeat with the glassless carrier.

If the enlargement made using glass is sharper overall than it was when projected in the glassless carrier, the latter is not holding the film adequately flat. You'll note that we do not recommend using the enlarger lens at full aperture. There are two reasons. First, the enlarger lens will give best definition at the apertures we've indicated. Secondly, some buckle will inevitably take place even in the best of glassless carriers. By adopting an intelligently small aperture where you will get the sharpest results, you increase your depth of focus and make some allowance for minor film buckling.

56. Enlarger Lens Test

If you find your enlargements slightly sharper in the center than at the edges even with a glass carrier, either your camera



• Check enlargement center against edges using a 10 or 20 X magnifier to see if grain is as sharp in corners as in center of picture. It should be (Test 56).

lens or enlarging lens is at fault. It's a simple matter to find the culprit.

1. Make a glossy enlargement of good size so that you can see the difference in sharpness between center and edge clearly.
2. Examine the sharpness of the grain edge itself right on the print with a 10X or 20X magnifier.

If the grain seems just as sharp in the corners but the image itself is unsharp, better check your camera lens (see Test 5). A grain edge that seems less sharp at the corners of the enlargement than at the center means your enlargement lens is poor.

Incidentally, it is possible that some poorly made enlarging lenses will simply deliver an overall degraded image. We've found that you get what you pay for in enlarging lenses. A good but necessarily expensive enlarger lens will outperform a poor one on overall performance center and edge. The only way to check how your own enlarging lens stacks up is to borrow a high quality one. For 35mm film, the Leitz Focotar, El-Nikkor or Schneider Componar lenses can be considered standards of excellence. In longer focal length for larger negatives the various Schneider Componars should be used as the test lenses. A good camera lens can be used quite successfully as an enlarging lens, although it will never quite equal the performance of the best enlarging lenses.

57. Enlarger Vibration Test

Place your enlarger on a level floor when there is no one in the room who might cause vibrations in the floor. Raise the enlarger lamp housing to its highest position. Here vibrations will be most noticeable. Then gently push the top of the support post or stand horizontally. A slight vibration of housing and post is allowable. However, both should stop vibrating in a few seconds. Enlargers that vibrate when heavy traffic passes your house are to be avoided.

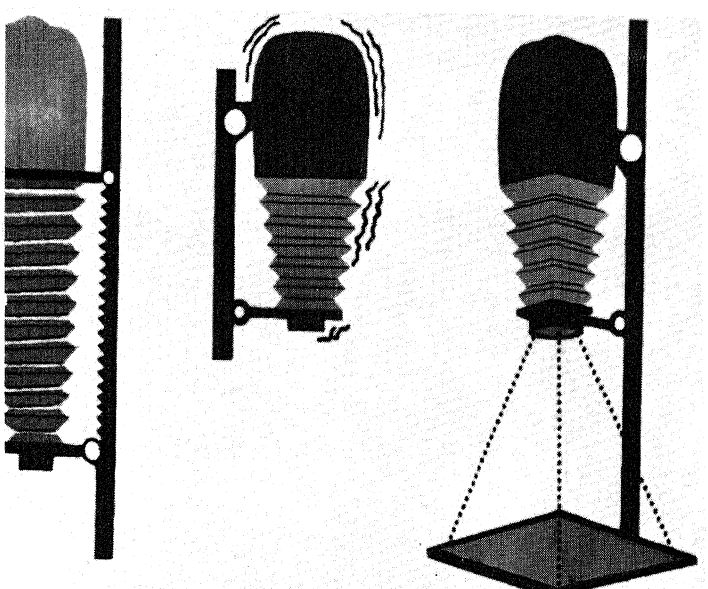
58. General Enlarger Test

Cap the enlarger lens and turn on the enlarger light. Extend the bellows slowly. Look for tiny traces of light (pinholes or cracks in the bellows). Focusing should be smooth. If it's not,

search for the missing gear teeth or for uneven friction wheels in the focusing mechanism. To check lens alignment, place a carpenter's level on or against the lens board. If all tilts are in zero position and baseboard is level, then lens and negative carrier should check out level with baseboard and with each other—assuming that your floor is level.

59. Enlarger Vertical Alignment Test

Often, a photographer's enlargements are not sharp overall yet careful tests of camera, film, and enlarger lens fail to yield the cause. If the enlarger is of the type that has a swinging lamphouse, allowing wall projection, there may be a simple answer. Many such enlargers have no marking to indicate proper vertical alignment of the housing. The markings may



• Check enlarging vibration by pushing housing gently (center). Extend bellows to examine for light leaks (left). Raise to height (right) for light test (Tests 58, 59, 60).

be too broad or just wrong. You can check this rather quickly by the following method:

1. With the negative carrier in the enlarger, measure the width and length of the focused projected outline of the negative carrier on the easel or baseboard. Measure width and length at both ends. If the picture is a perfect rectangle indicating proper vertical alignment, the opposite measurements on the baseboard or easel should be exactly equal to each other. If they're not, align the head until they are.

60. Enlarger Illumination Test

With negative carrier empty, raise the enlarger to project an area of about 11 x 14 on easel. At full aperature, focus projected carrier edge sharply. Make a test strip as though you were using a negative to determine the enlarging time for light grey tone. Then, using this time, make a grey print on 11 x 14 paper. Close lens down three openings. Increase exposure accordingly. Make a second print. Compare the two prints. The first should be darker in the center than at its edges. The second should have an even grey tone. Here's why. Although most enlargers project more light through the center of the negative than through the edges at widest aperture, light fall-off should not be apparent when the lens is closed to the opening you would normally use for printing.

61. Enlargement Sharpness Test

Despite careful tests made of the enlarging lens, camera lens and enlarging system, there may still lurk in your mind the suspicion that your enlargements could look sharper. Try the following: Make a good size enlargement on glossy paper at f/8, focusing as carefully as you can. After processing and drying it, examine the image with a magnifying glass. You'll notice that the image is made up of small grains with fairly sharp edges—at least they should be sharp. Examine the grain patterns of the subject in the center against the patterns at the edges of the negatives. The grains should be equally sharp throughout the print area. If they're not, your enlarger or enlarging lens is at fault. Better check them again.

Incidentally, you might find those sharp grains quite helpful in your normal enlarging procedures. If you have a good

enlarger and lens plus a sharp eye, you can get what is near perfect focus by focusing on the grain sharpness rather than on the image itself! Of course, this can only be done when you are enlarging a fairly grainy small negative to a good size. And in any event, once you focus, you should stop your enlarging lens down before making the enlargement since some technicians do claim that the point at which the grains are sharp and the point at which the image is sharp do not always coincide exactly. By stopping down your lens, you will increase depth of sharpness and obviate this if it does exist.

MISCELLANEOUS TESTS

MISCELLANEOUS TESTS

62. Flash Reflector Coverage Test

A vast disparity exists between the covering power, the evenness and efficiency of flash reflectors. This applies to both bulbs and electronic flash units. All reflectors supposedly throw an even light of sufficiently broad coverage to light up the entire area covered by a normal focal-length lens. The truth is many do not. Some throw an even light which simply does not cover the picture area while others are capable of covering the picture area but deliver more light, commonly called a hot spot, in the central portion of the picture area.

The causes are many. There is the trend to manufacture smaller reflectors. In attempts to make the new units foldable, more compact, more appealing in looks, some manufacturers have sacrificed too much of the reflector's capacity.

If your camera has a slightly-wider-than-normal lens ("normal" is 50mm for 35mm cameras, 75-80mm for 2¼ x 2¼ cameras), many units which do cover the area seen by a normal focal length may not cover the wide angle area. If you own a camera with a slightly-*longer*-than-normal focal length lens (55–58 in 35mm cameras, 80mm or longer in 2¼ x 2¼ sizes), some units which do not cover properly for the standard, normal lens may give you excellent coverage since your lens actually sees a smaller angle of acceptance than does the average normal focal-length lens.

Unfortunately few, if any, reflector manufacturers at present provide enough data for you to make a definite comparison of units without tests. Here then is a simple yet definitive test to show you just what your flash unit is or is not covering:

1. Line up your camera on a tripod perfectly parallel to and about 8 feet from a blank, light-colored wall.

2. With masking or similar tape that will not mar the wall, outline the area actually seen through your view-finder. If your camera has parallax markings, make sure you correct the finder for this particular distance—although no great harm can come if you have no such correction at this distance.

What you now have on your wall is quite close to the area which will actually be covered by your negative if you were to take a picture. (It may be slightly smaller since many finders do cheat slightly. See finder accuracy Test 35). If you have an additional wide angle lens, also trace the area seen in the finder covered by the wide angle

3. Load your camera with a slow color film.

4. Remove the camera from the tripod.

5. Mount your flash gun on the tripod pointed directly at the center of the outlined area.

6. Move your loaded camera back about three feet more and to the side of the tripod so than when you view the wall through the camera finder, you see the entire outlined area plus a good amount of additional space. It doesn't matter if the reflector itself appears in the finder as long as it isn't precisely in the center.

7. Calculate your exposure basing your guide number on the flash-to-wall distance, not your camera-to-wall distance. Since you are shooting a fairly light color wall, however, close down your lens one full stop from the suggested aperture. (If the recommended lens aperture is f/4, use f/5.6; if f/5.6, use f/8 and so on).

8. Make an exposure using a long connecting cord to synchronize both flash unit and camera shutter. If you have no such cord, you can make the test by putting your camera on a second tripod and having someone else set off the flash while you hold the shutter open on bulb with a cable release. Naturally, in this case you must calculate your exposure for open flash. With electronic flash, the shutter speed and your use of B has no effect on the suggested opening.

When you get your film back from the processors, you will

see clearly outlined within the picture area masked on the wall, the exact covering ability of your flash unit. Don't be surprised if there seems to be slight falling off of illumination from the center towards the corners. Some is natural. However, if fall-off is great and the corners of the masked area are almost dark your flash reflector simply will not cover the picture area of your camera and lens.

Note that we've specified the use of color film for this test rather than black-and-white. There is a good reason for using color, unless, of course, you intend to shoot all your flash shots in black-and-white. Color film has less latitude—that is—if light falls off it will show up more visibly than it will on black-and-white material.

63. Flash Guide Number Test

Although the guide number recommendations furnished on the back of a sleeve of flashguns can be considered quite accurate for use, the same cannot be said about the guide numbers furnished by the manufacturers of electronic flash units. The units may be well made and designed for long life, but many manufacturers—most, for that matter—furnish a guide number which is actually far higher than a simple test will indicate for average subjects.

Before purchasing an electronic flash unit, it is wise to make a simple test of its capabilities as far as power is concerned. Here's how:

1. Place the electronic flash reflector at exactly ten feet from an average subject (a person seated in a chair will do) in an average room that you might normally use for picture making.

2. With a slow color film such as Kodachrome—or, with larger than 35mm, Ektachrome—make a series of exposures, starting with the recommended guide number and then vary the exposure one and two full lens openings under and over. Keep track of your exposure data. If you use a human subject, you can have him or her hold a small card with the proper exposure data, so there will be no chance of error when the transparency is returned from the processor.

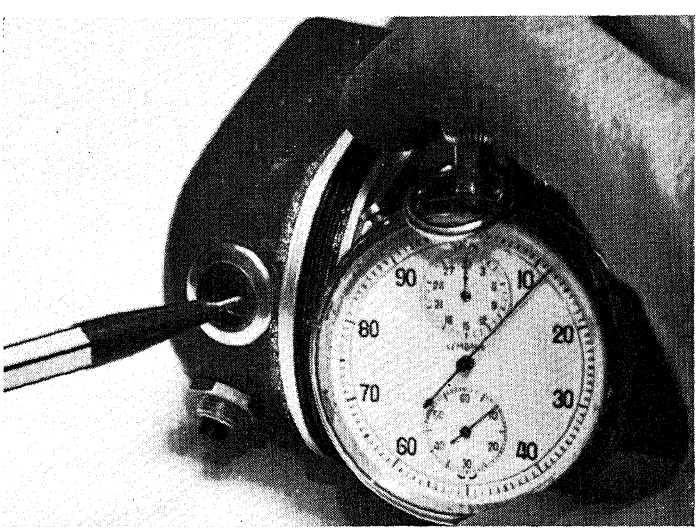
3. Pick the best transparency. Find your own guide number by multiplying flash-to-subject distance by the f/stop used for best results.

4. You don't have to make a test for every film. Determine how much faster the new film is than the one tested—i.e. 2X, 3X, etc.—by dividing the film speed of Kodachrome (or other color film tested) into the film speed rating to be used for the new film. The result is the "times faster" figure. Select the multiplying factor beneath it. Multiply the guide number for the color film tested by this amount to find the guide number for the new film.

"Times faster"	2	2.5	3	4	5	6	8	10	12	16	32
Multiplying factor	1.4	1.6	1.7	2.0	2.2	2.4	2.8	3.2	3.5	4.0	5.7

64. Electronic Flash Recycling Light Test

Most of today's electronic flash units have a tiny light which goes on some seconds after a flash shot is made to indicate that the unit is charged and ready for another shot. However, by the electronic nature of the beast, after the flash, the capacitors charge up swiftly, tapering off slowly as they reach full capacity. In other words, for the unit to go from zero capacity



• Many speedlight recycling times are off (Test 64).

to 60% will take only a fraction of the time that it will to go from 60 to 85%.

Ready lights are designed to light when the units have reached a suitable percentage of full charge. If they were to wait for full charge both photographer and subject would have long since disappeared. Unfortunately too many ready lights are advanced to the point where they indicate a picture can be taken when actually there reallly isn't sufficient power to give you the right exposure. A supposedly fast recycling time is a worthwhile feature. But is it real or artificial? Perhaps the unit itself is slightly out of order and is indicating capacity before it should. If you have such a unit you must definitely test it. Here's how:

1. Using color film, allow the unit a full warm up period of at least a half minute beyond the time that the ready light goes on. Then, with proper guide number and exposure (see Flash Guide Number Test 63), shoot an average subject at about five feet camera-to-subject distance. A person sitting in a chair is quite suitable. Make sure that other lighting is absent or very subdued. Now watch your ready light carefully. As soon as it comes on shoot another picture quickly at the same exposure. A comparison of the two shots will quickly show you whether the ready light is cheating. If the exposure is slightly under you know that you can't rely completely on the ready light. On the other hand, this doesn't mean you should get rid of the unit. Make a second series of tests shooting the same subject with the same exposure when the ready light appears, 5 seconds, after it appears, 15 seconds, 20 seconds—right up to the original 30 second warm-up mark. Examine the results and simply allow that much additional post-ready light time when using the unit.

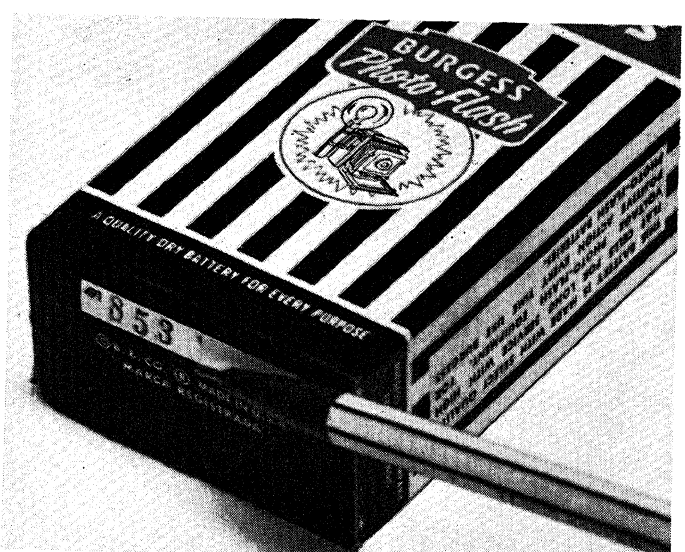
65. Fresh Battery Test

Some battery makers have stopped dating their products. Always, try to purchase dated flash batteries. While, like film, storage plays a very important part in battery life, a "put in use before" date is at least an indication of age, if not a complete guarantee. A voltmeter can be purchased and is helpful if you use a great supply of batteries.

66. Tripod Test

How steady is your tripod? How steady is the one you're planning to buy? Usually the standard test employed in many photo stores—leaning heavily on top of a tripod and noting its rock steadiness—is as useful as testing a car by kicking a tire. Certainly, if you bear down from above the tripod will seem steadfast. After all, you're helping it. You must test a tripod while it's standing on its own three feet with no help from you.

A tripod need not be heavy to be steady. However, it should be sturdy. The countless chromiumed telescoping little gems available with elevator units, tilt tops, bubble levels are all uniformly poor in steadiness. The legs are far too springy and flexible when extended. Reject a tripod right off if its extended legs flex inwards. The legs must be absolutely rigid. When extended the various legs must be just as steady as a single solid piece of metal or wood. However, don't rule out sturdy tripods which are made of light metals. Many of the



• Cryptic identification on flash batteries may mean something to the maker. Look for those with dates (Test 65).

new imported units are formed from U beams or hollow O beams and are quite solid. They are only somewhat dangerous in wind—particularly if you use them with a light 35mm or 2¼ x 2¼ camera which won't keep their feet firmly on the ground. Surprisingly, these lighter sturdy tripods are steadier with heavy cameras.

To test a tripod for steadiness:

1. Extend the tripod fully, including the elevator if it has one.
2. Place your camera on the tripod and tighten the anchor screw. If you own more than one type of camera, you must try the test with both types since a heavy camera will not necessarily put a greater strain on a tripod than a light one.
3. With the camera in place and all controls locked so they will not move, attempt to twist the camera gently in both right and left directions; also up and down.
4. Reject any tripod showing the slightest movement or free play.
5. If the camera has provision for vertical placement of the camera, repeat the test in the vertical position.

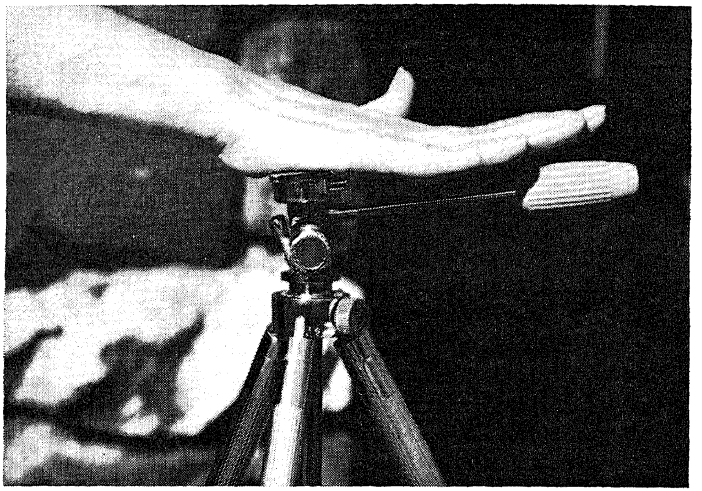
Although you might think that a slight movement has little chance of impairing your picture taking—particularly if you're going to use a cable release, remember that the camera itself —its shutter mechanism—will deliver some shock to the camera during exposure. In addition, a small amount of movement or play can easily grow into a large amount with use.

Steadiness is not the only test for a tripod. Many tripods have knurled rings around each leg segment which lock the segments in place. Many of these are obstinate indeed—when you least expect it.

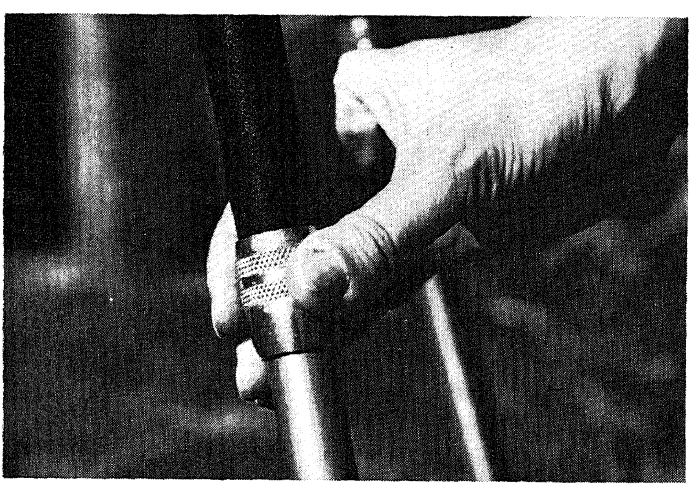
1. With the leg extended, tighten the ring firmly and then check how much force it takes to untighten it.

If it takes more force to untighten than to tighten, there is every possibility that you will someday tighten the lock and be unable to untighten it again without using a pair of pliers or other tool, which may strip the threads.

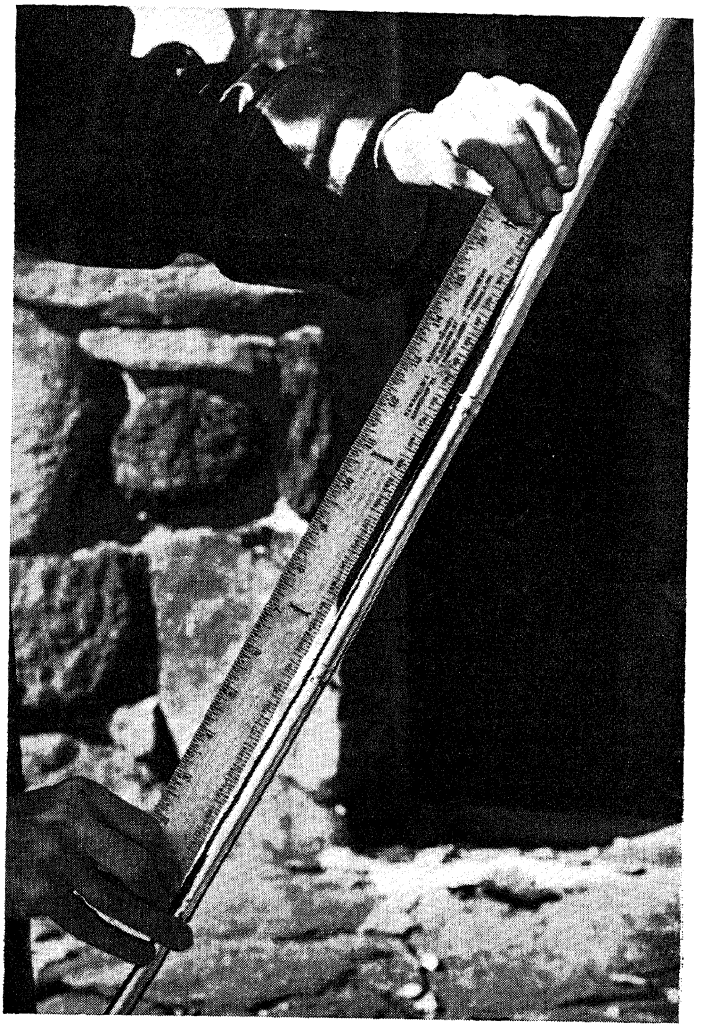
Footing is very important to a tripod, too. Although most tripods have some sort of spread stop, there are a good number of units whose legs have no control to lock them in a standing position. If such a control is lacking and you intend to use the tripod indoors, find the smoothest floor you intend to stand it on and see if, when a little pressure is applied from



• How wobbly is the tripod when you put your open palm on its head and bear down? Oddly, tripods that wobble often hold heavy cameras more securely than light ones (Test 66).



• Tripods with knurled collar locking legs may have a tendency to bind. If it takes more energy to untighten than to tighten knurled collar, watch out! (Test 66).



• That tripod was beautifully finished and fairly heavy. Then a straight ruler gave its unsteady footing away. Telescoping tripods with too many sections are apt to have this specific and inexcusable disease (Test 66).

above, the tripod will stand. Many spread eaglewise under this test. T'would be a pity to have your camera on it when this occurs.

67. Sunshade Efficiency Test

We strongly recommend that you use a sunshade whenever possible, both indoors and out, to prevent extraneous light from striking your lens and degrading your pictures. The proper sunshade is important. Many lens makers furnish specifically shaped sunshades for the various focal length lenses they manufacture. These should be used if available since the angle of the sunshade follows closely the exact viewing angle of the lens. If no sunshade is furnished by the manufacturer, and a standard sunshade is obtained from another source, you must be careful that it fits the requirements. A sunshade with an insufficient viewing angle will cause vignetting (darkening of the picture corners). If the sunshade has too great an angle, it may not ruin your pictures but it can be as efficient as possible in eliminating stray light.

The test for vignetting is the most important.

1. Place the sunshade over the lens and, with your lens focused at its closest focusing distance, take a few pictures of the sky when either blue or completely overcast. A white wall will also do.

2. Repeat the same test at an infinity setting.

3. If you are in the habit of using closeup lenses, filters or other lens accessories, make this test with them in place and the sunshade fastened on last.

If the corners of the pictures are dark, you probably need a larger sunshade.

Testing a shade to see whether it's too big becomes a little more tricky. Here's a way to do it.

1. In pieces of opaque black paper or cardboard, cut a series of holes of decreasing circumference starting with the diameter of the lens shade.

2. Repeat the tests previously suggested holding these circles in front of the shade.

3. If the vignetting shows up on your negatives when you decrease the sunshade aperture slightly, the shade is efficient. If you can decrease the diameter by a good amount before vignetting occurs, the shade is not as efficient as a smaller one would be.

68. Neutral Density Filter Test

Are neutral density filters really neutral? After considerable examination, we've come to the conclusion that some are more neutral than others—but few, if any, could truly be called completely neutral. In case you are puzzled as to why neutral density filters (or N.D. filters as they're called) exist, here's the answer. When using extremely fast film outdoors or electronic flash or flash closeup indoors, it's often impossible to get a usable exposure that is short enough. The neutral density filter, when placed over the lens, cuts the amount of light reaching the film thus allowing a usable exposure to be made. The greater the density of the filter the less light reaches the film. Two or more filters can be combined if one won't do the job. Aside from an obvious check to see whether your exposure with the N.D. filter is right, you will not run into much trouble with black-and-white photography. The rather wide exposure latitude of black-and-white film will largely nullify any small filter factor errors. With color film, the story is obviously quite different. A good neutral density filter ostensibly adds no color, nor does it subtract any from the subject. Before relying on N.D. filter for color, give it a neutrality test.

1. Find a slightly pastellish landscape with detail and delicate color. White should be included.
2. Make an exposure without the filter using a meter carefully.
3. Now place the filter over the lens. Calculate the proper shutter speed for the same lens opening that you used without the filter.

When the film is processed compare each slide or transparency side by side on an evenly lit light box or similar device. Use a magnifying glass to examine detail and color. Is there a difference? Look at the whites carefully—also the delicate colors. We advise comparison side by side since the eye has a dreadful habit of "accommodating" to errors in color if the slides are shown one at a time on a screen. However, you can and should test sharpness of the N.D. filter by projection. Don't use a beaded screen to check sharpness. The beads disperse the light and soften the fine edges of the subject material. Project on a flat surface—a plain flat wall if necessary, at least for the sharpness test. A careful examination

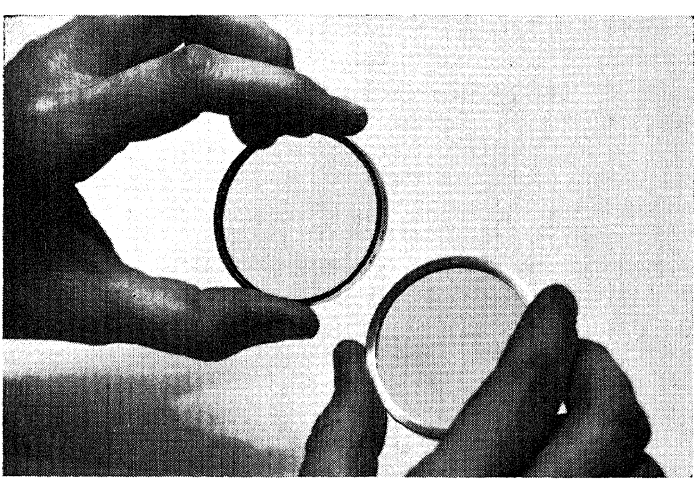
by eye fairly close to the projected images will tell you whether the N.D. filter is causing or will cause loss of sharpness.

69. Filter Quality Test

Most photographers have a sneaky suspicion that the filters of various manufacturers vary in performance. They are quite right. On the whole, for general photographic use (as opposed to scientific or photoengraving purposes) the better known manufacturers turn out first quality filters—whether they use dye in the mass glass, or gelatine or plastic between glass. There are many filters, however, which are not up to par. There's certainly no reason to neglect a test for quality.

1. Make two test exposures of a distant scene with much detail—one with filter, the other without. Don't forget to change exposure by altering shutter speed to allow for the filter factor.

2. Compare the two negatives under a high power (20X) magnifier or make careful prints of each. Is there any appreciable loss of quality in the filtered shot? Incidentally, you will find that the same designation of filter—skylight, medium yellow, deep red, etc.—may vary in color from one manu-



• Are filters of different makes bearing the same markings of equal quality? Does it matter if you can see a color differentiation? (Test 69).

facturer to another, even to such an extent that you can see the difference plainly when you compare the two filters. Since so much depends on the coloration inherent in your lens, and on the characteristics of the film itself, little inference can be drawn from these variations and one cannot be necessarily recommended above another. In all tests we have made, no manufacturer's filter color was found to be unacceptable.

70. Lamp Brightness Test

Any continuing light source, be it flood, reflector flood, enlarger, spotlight or projection lamp, begins to age from the moment you first turn it on. After a certain lifetime it starts to darken, give less illumination, and changes color. You may not notice the difference if you've been using the same light rather constantly. Most photographers use a bulb until it burns out. But bulbs not yet burned out can ruin pictures.

• How bright is your flood or spot? Is it wearing out? Set up a standard lighting and check brightness with your exposure meter. Use a grey card for reading (Test 70).

We need not be overly concerned about projection lamps. If they are slightly discolored or are losing brilliance, your eye will seldom notice the change. However, you will certainly be surprised when you do put in a new lamp and note how much more brilliant it seemed than the last one. You will ruin no pictures using an old lamp.

In like manner the age of the lamp bulb will matter little in black-and-white photography. Your exposure meter will automatically compensate for the loss of brightness or the film's latitude will cover the loss.

In color, however, even if you use a meter, the change in coloration of a bulb can materially effect the color balance in your pictures. Without recourse to color temperature meters (these too can be rather contrary), here's a simple check you should make:

1. Take a new lamp, place it in the reflector you intend to use—be sure the reflector is clean—and shine the light on a white wall, grey card or cardboard about 10 feet away.

2. Carefully measure the amount of light falling on the cardboard with a reflecting type meter at a specific distance a few feet from the board. Make sure your shadow or the meter's shadow isn't measured.

This reading jotted down will furnish you with a constant check of the lamp, or any lamp of the same make, whenever you suspect it may be getting weak. Periodic checks are best. When the meter fails to give substantially the same reading, either relegate the lamp to use in black-and-white work exclusively, or throw it away.

A word of caution: Since excessive drains are often put on the average house currents, make sure you test the flood with all major appliances in your house or apartment turned off.

71. Thermometer Accuracy Test

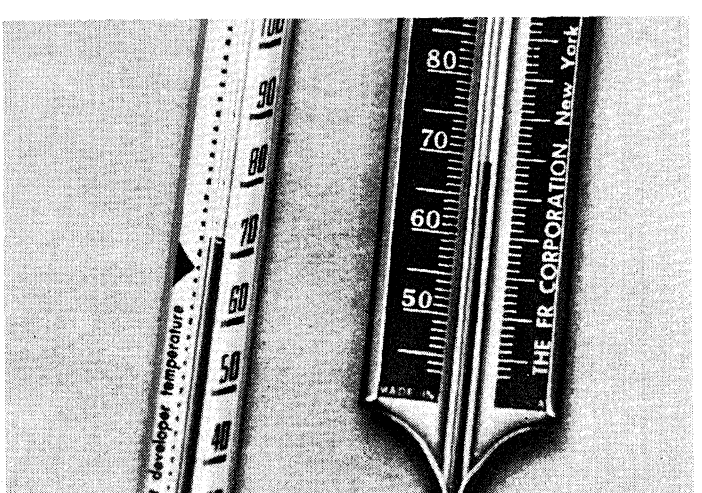
Recently, we were taken to task quite forcefully by one of the leading color labs in the country. We had advised a specific developing time for a certain film. The lab had followed it and had obtained erroneous results. We sheepishly suggested that their very expensive temperature regulation system might be out of wack. A check with a 79¢ thermometer revealed that this was indeed the case. To test a thermometer, there is

but one simple method. Compare it with another thermometer. If you don't wish to keep two thermometers around the house, or if you suspect both to be wrong, or have thermometers which disagree, take them to your dealer and compare with his.

72. Fresh Film and Paper Test

An expiration date on a container of film or paper is an indication of the material's freshness, but is no sure guarantee. The date is meaningful provided the material has been stored properly, but still you have no way of knowing whether it was damaged during transportation from maker to distributor, in the distributor's hands, or finally in transport to the dealer or in his hands. Perhaps he locked up the store for a summer vacation, turned off the air conditioning and left it to cook in a warm place.

Chances of this happening are small with individual rolls of film or small boxes of paper. However, chances of stale film turning up in bulk loads of 100 ft. (35mm mostly) are relatively great. And the unwary purchaser is often stuck with all sorts of surplus film and paper. If you buy in bulk and are not



• How do you check a thermometer's accuracy? By comparing it against another. These don't agree (Test 71).

absolutely sure of your source, try a short strip of the bulk film or a few sample pieces of paper before committing all your pictures to it. Don't rely on guarantees. Most guarantees merely offer to replace the material with more of the same, which is somewhat akin to adding insult to injury.

73. Levelling Test

Every photographer at one time or other has attempted to find an absolute level for setting up his tripod, his enlarger, or a table for darkroom work. Unfortunately, few houses or apartments, whether modern or old, are truly level. Houses settle and as they settle the floors and walls become somewhat misaligned to the true vertical or horizontal planes. You can test for a true vertical or horizontal with a bubble level.

Most bubble levels in hardware stores are rather awkward to use. Instead try one of the smaller levels that can be purchased from most stores carrying high fidelity phonograph components.

74. Projection Flatness Test

When projecting transparencies or movies you may notice that one edge of the picture seems unsharp while the other

• All sorts of bargains in paper and film are offered. Some are good moneysavers, others are traps which will ruin your pictures. How about those 35mm bulk films? (Test 72).

remains sharp. If so, make the following test to see whether it's your projection method or the machine itself:

1. Place projector and screen absolutely parallel with each other and project to maximum size. In other words, don't use the elevation device on the projector.

2. Measure the two heights and widths at the picture edges. Opposite edges should match in length. If they do and the picture remains unsharp at one edge, there is some misalignment in your projector. If the unsharpness clears up, simply remember that the elevating device on the projector should not be used, or used as little as possible for sharpest projection.

A non-parallel projector may not be the only cause of unsharpness. Your slides may be sharp in one area and unsharp in another—and it may not be the fault of a poor lens either. Here's the test:

Project to full size a slide known to be sharp overall after examination with a 10X or better magnifier.

2. Focus carefully and examine the picture. If the projected picture shows central sharpness with falloff of sharpness at all four corners, the lens is at fault. If the areas of sharpness and unsharpness don't follow an exact pattern but seem to be splotchy, you have a depth of focus problem on your hands. Here is why:

With the ever increasing demand for brighter and larger screen images, many projector makers are today using faster projection lenses and higher wattage lamps. The higher wattage lamps heat the slides and cause buckling or popping either during projection (in older projectors) or before by prewarming or prepopping (in the newer units). The fast lenses, however, have an inherently shallow depth of focus—that is unless the slides are absolutely flat, they cannot be projected with overall sharpness. If this seems to be happening in your projection system, use the following check to make sure:

1. Take a good sharp slide, remove it from its mount and remount in a glass slide binder. Now project it again. If it turns out to be sharp, the culprit is a combination of narrow depth of focus and fast lens. Many projector manufacturers furnish accessory lenses in different apertures and focal length. Check with your photo dealer and see if he will let you try a shorter focal length lens with the same or a smaller aperture. This will often clear up the problem. The only alternative is to remount all your slides in glass.

75. Bounce Light Coloration Test

There are many possible reasons why your transparencies may seem off color when they are returned from the processor. However, if you are satisfied, by and large, with the coloration of your transparencies except when shooting with bounce light, the trouble may be with your light source or the color of the surface from which you are bouncing the light. Make this simple test:

1. Shoot part of a roll of color film using the bounce light that seems to give you the off color results.
2. On the same film shoot the same subject with direct light from the same light source, recalculating your exposure, of course.

A check of the two processed shots will indicate whether the bounce light is at fault. If there is a marked change in coloration between the bounce and the non-bounce shots, the ceiling or other surface used for the bounce is at fault. It's simply not sufficiently neutral in tone.

76. Color Processing Test

There is nothing more ghastly than to receive a roll of processed color film that has an overall blue, pink or some other color cast. The fault may be with the film or processor—assuming you used the right type of film with proper light source and correct filters, if filters are necessary. If this happens only once, you may never be able to put your finger on the culprit —film maker or processor. However, if more than one film from the same processor seems off color to you, make this check:

1. Shoot two identical rolls of color film of brightly colored subjects under the same lighting conditions. Make sure that some white object is included.
2. Send one roll to your usual processor and the other to the film maker for processing. (All film makers maintain facilities for processing their own films. They are generally more expensive and may take slightly longer than an independent processor).
3. When the film is returned, check the two sets of pictures. Are there differences in coloration? Which do you like best?

Of course, the foregoing test is based on the assumption that the lab will probably repeat their processing mistakes. If your color results are sporadically poor and interspersed with good color processing, simply change labs. To try to catch the lab in the act of improper processing will cost more money and time than it is actually worth.

77. Distance Judging Test

While we all hope that there will be time to focus accurately for every picture, many occasions come up when this is simply not the case. Years ago, before rangefinder and reflex focusing systems were so widespread, professional photographers prided themselves on their ability to judge distance. Today few photographers train themselves to judge distances in emergencies. Here's a little test you can carry out at your leisure to help you check your own ability to judge distances accurately:

1. Choose a specific number of feet, say 10 (a good round number). Wherever you are—at home, or just walking down the street—spot some object ahead of you and guess how far away it is. Make your calculations in terms of 10 ft. units, or the number you have chosen.

2. Count your steps from that moment until you reach the object. You can figure roughly that each stride is about 3 ft. in length. If you use smaller steps, make a test with a yardstick to determine about how much ground you actually cover with each step and use this measurement instead.

3. After a few days of checking the 10 ft. or other unit interval, you should be rather proficient at estimating it. Now switch to some other unit, preferably one that is marked on the focusing scale of your camera and repeat your daily estimates and checks with this distance. Don't forget to check your original 10 ft. unit every once in a while so that you don't lose it.

4. You should be able to learn to estimate a good number of distances in this manner. Keep in mind, of course, that the shorter distances with their inherently shallower depth of field are more important to estimate correctly than the longer ones.

5. Start estimating irregular, in-between distances and check these against your stride. Once you have this down pat

you should be able to put your ability to photographic use, if and when it's actually needed.

There's an alternative distance guessing test that requires a sure eye and more practice. This one makes use of your camera's viewfinder.

1. Through the finder note the size of a standing man at various distances.

2. Check the size against the focusing scale of the camera after you've focused carefully on him. In time you should be able to judge the distance quite accurately by noting the height of a human subject within the viewfinder.

78. The Final Test

Does your equipment take and make pictures which you like and find acceptable in quality? If this is so you are indeed a lucky photographer.

FORTY-SIX POINT CAMERA CHECK TEST

FORTY-SIX POINT CAMERA CHECK TEST

Buying a used camera is an art. How can you tell whether the camera you want to buy was formerly the property of a little old lady who never drove it over ten pictures a month, or the slavey of a TV wrestler who only abused it during drunken rages? While the store selling the camera is eager to please you, the burden of separating the little old lady cameras from the wrestler cameras is, understandably, on you. While the comprehensive tests in this book will prove useful when you have more time, you need a speedier all-inclusive test procedure when examining a camera against a guarantee deadline. The check list that follows is divided into two sections—the steps you can take at the store before you bring your proud possession home, and the tests you must make once you have the camera in your possession. If all goes well and you're able to check out all the points affirmatively, you're going to be tired—but happy. You should have a good used camera. To put any new camera through this check list won't do any harm either. You should insist on a 5 or 10-day written guarantee from the store offering you your money back if the camera is not acceptable. There also should be an agreement for repairs during a specified period after the camera is purchased. While it's out of the question to make any tests foolproof, the outline to follow is as comprehen-

sive as possible. First, here are the tests you should make in the store before you buy a camera:

1. Examine all moving parts for wear and tear. Look for dents, abrasions, and scratches on the camera. These might indicate that the camera had been dropped at one time and that there might be internal injuries.

2. Another indication of the camera's general condition may come from a glance at the leather trim. If the leather is raised at certain points, look underneath it to see if any screws or latches have been tampered with.

3. Look for holes or other indications showing that some part of the camera might be missing.

4. Check the tripod socket. If a tripod or flash attachment had been screwed into it too tightly, a tiny puncture might have resulted which may cause light streaks on film.

5. If the camera has a bellows, extend it, open the back or take out the lens, then hold it up to a light bulb and look for holes or cracks. Wooden press cameras should be inspected carefully for rotting, cracks, missing screws, and warped frames.

Lens and mount

6. Hold the lens at an angle so that an overhead light will reflect from the surface. Look at the front, rear, and inside elements for scratches, and rubbed off coating.

7. Shake the lens and listen for chips of glass and loose elements. If the front element is loose, tighten the ring holding it in place. Make sure the lens is seated squarely in the mount, not at an angle or to one side.

8. Examine the filter threads. If the lens has been damaged or dropped, the threads often become imperfect. Screw an appropriate filter or retaining ring into the threads. The ring should thread easily, smoothly, and securely.

9. Open and close the diaphragm blades. The blades should move smoothly. Look for rust on the blades and make sure none is bent, broken, or missing. Rock the lens-mount to detect play. Disregard a small amount. However, if the mount moves at all, be sure that it returns to exactly the same position each time you move it back and forth.

10. For single-lens reflexes with automatic diaphragms —open the back of the camera, set, then release the shutter.

Be sure that the automatic mechanism works smoothly and in the correct sequence—the diaphragm should close down and the mirror must fly up before the shutter is released. Ascertain whether the diaphragm opens fully for focusing and closes to the correct aperture during exposure.

11. For twin-lens reflexes, open the camera back and set the shutter on B or T, then move the f-number adjustment wheel or lever to examine the condition of the diaphragm blades.

12. Release the shutter at all speeds and listen carefully for any grating or unusual noises. Pay special attention to the slower speeds since these speeds usually cause the most trouble in all shutters.

13. If the camera has a focal place shutter, check for worn or torn areas which could cause a light leak. Open the back and hold the camera between you and a light bulb. Look for tiny pinholes before and after the shutter is released. Examine leaf-type shutters for broken or bent leaves, and areas of rust.

Viewing and focusing

14. If you're examining a 35mm single-lens reflex camera with removable lens, take the lens out and check the mirror for chips, scratches, discoloration, and any indication of its having been tampered with by an amateur repairman.

15. To check viewing, replace the lens (if you took it out) and focus the camera on an object about 6 ft. away. Make sure you can see a clean, sharp image through the focusing window. Mildew, grit, and moisture can cause the image to appear unsharp.

16. If the camera has a removable prism, check its seating. Check the prism's brightness and sharpness against a new camera, if you can. If there's a built-in split-image rangefinder, check its focus against the focus on the ground glass.

17. For 35mm rangefinder cameras, make sure the viewing and rangefinder systems are clear and clean. The rangefinder's focusing image must line up horizontally and vertically. Focus on an object about 6 ft. away and see for yourself. Some rangefinders will line up one way and not the other. This occurs when the mirror or prism inside the rangefinder is out of alignment.

18. To check the twin-lens reflex camera's viewing and focusing system, first look into the viewing lens and check

the mirror for chips, scratches, or discoloration. Focus the camera at about 4 ft., and rock the focusing mount back and forth to reveal play. If the mount moves slightly, disregard the play. However, if it moves and does not return to the same position each time you let go of it, the focusing system may be inaccurate.

19. For a press camera, check the optical finder for clarity. Focus through the rangefinder and see if the image lines up vertically and horizontally. Also, focus on an object about 6 ft. away with the rangefinder, and see if the focus coincides with ground-glass focus.

20. Check the focusing system of all types of cameras, whether reflex or rangefinder. Focus on objects at 6 ft., 12 ft., and infinity. For each distance, focus the lens starting from the close-focus position, then focus again on the same object —only this time, start from the infinity position. A variation shown on the camera's distance scale may reveal slippage inside the rangefinder, focusing wheel, or focusing mount. If you note any difference, check the focus at that distance once more to eliminate an error possibly caused by your eye.

21. Open the camera back and check for dents, scrapes, and bent areas. Close the back and open it again. It must close tightly but should not stick.

22. Look for scratches, burrs, and dents on the film guide strips, rollers and pressure plate. The spring behind the plate should return it to the same position when you release your finger.

23. Place a roll of film in the camera and wind it through. Check these points: Frame counter should count off each exposure; you should not hear any odd noises when you advance the film; the film advance mechanism should work without any unusual pressure.

24. If you're checking a 35mm camera, after the film is wound through, press the rewind button or lever and rewind the film back into the cassette. Listen for noises and feel for excessive pressure on the film.

25. Remove test film from the camera. Take the film out of cassette (separate film from paper backing if you used roll film). Examine it carefully on the emulsion and base side for scratches or abrasions. If you find any, run another roll through and see if the marks appear in exactly the same places.

If they don't appear, or if they are in different places, then they are caused by the cassette. But if the same marks appear again, trace them to the camera's pressure plate (if the marks are on the film base), or to the film rollers or guides (if the marks are on the emulsion side). When you get your camera home, carry out all these tests immediately.

26. Few shutters have exact speeds. It's more important that they be consistent. Each shutter speed should expose film for the same duration of time whenever you use it. Shutter speeds should also be in the proper relationship with one another. A 1/100 sec. doesn't have to be exact, but it must be twice as fast as the 1/50 sec. setting, and half as fast as 1/200 sec.

27. To test shutter speed relationships, photograph a white or light-colored wall. Use a fine-grain film such as Kodak Panatomic-X.

28. Make exposure calculations with an exposure meter using 2X the recommended film speed setting.

29. Set your camera on a tripod and place it any distance from the wall which will fill up the entire frame with the wall. Be sure the camera is level and parallel to the wall.

30. Use as many shutter speeds as you can and vary the aperture to obtain the correct exposure setting for each frame. If your exposure meter indicates f/2 and 1/1000 sec. to be the proper exposure setting, then the following exposures must be: f/2.8 and 1/500 sec., f/4 and 1/250 sec., f/5.6 and 1/125 sec., f/8 and 1/60 sec., f/11 and 1/30 sec., f/16 and 1/15 sec., f/22 and 1/8 sec.

31. Process the film and examine the negatives. All frames should be equal in tone. If there is a variation (if one or more frames seem darker than the rest), then the frame or frames that are different were made with the erratic shutter speeds.

32. Also look for streaks within each frame which indicate a sticky shutter speed, or even a light leak in the focal plane curtain. If the camera has a leaf-type shutter, look for uneven distribution of light at the corners of each frame. This indicates a sticky leaf-shutter or bad lens.

Lens test

33. Photograph a building in sunlight from about 25 ft. away. Use a fine-grain film such as Panatomic-X.

34. Set your camera on a tripod and focus carefully on the building. Be sure the camera is level and parallel to the building.

35. Set your exposure meter (reflected or incident type) at 2X the recommended film speed and make a reading of the building for the largest lens opening. If the camera has a built-in meter, use it and compare its reading with that from a meter which is known to be correct.

36. If the largest f-number is f/2, then the corresponding shutter speed might be 1/1000 sec. Use this correct exposure setting for the first photograph. For each consecutive photo, close down the aperture one stop and halve the shutter speed. (Same procedure as the shutter tests.) For example: If the first exposure was f/2 and f/1000 sec., then the second should be f/2.8 and 1/500 sec.

37. Develop the film and examine each frame with at least a 10X magnifying glass (preferably a 20X).

38. The frame made at the largest aperture should be sharper in the center than at the edges. The frame shot at 2 to 3 openings smaller than wide open should be sharp from center to the edges. Examine frames made with the smaller lens openings—they should be sharp, also.

39. Make two comparison prints yourself or have them made by a lab. They should be about the maximum size your needs demand—8 x 10, 11 x 14, or 14 x 17.

40. Compare the sharpness of the print made from the negative which was taken at the camera's widest lens opening with the one made 2 to 3 lens openings smaller. If the difference between them is what you consider unsatisfactory, then the lens is not up to par.

41. Also examine horizontal and vertical lines near the edge of the picture frame. If they bend in or out, the lens has pincushion or barrel distortion. In this case, you must decide whether or not it's disturbing.

42. To test for color correction, make the same lens test, only this time with a color film such as Kodachrome. Be especially careful to examine the image near the picture edge. Any smearing of color will indicate that the lens lacks sufficient correction.

43. When you make the lens test, note the exact edges of the frame indicated by the camera's viewfinder or ground glass.

44. Compare the coverage with the actual negatives. Some cameras show a little less in the viewfinder than what the film records. This is normal and is somewhat of a safety feature incorporated in the camera's design to prevent "cutting off heads." There should be less coverage on the film than what can be seen in the viewfinder.

45. Use the camera. Take pictures. Make the kind of photographs you like. If you bought the camera to make scenics—do just that. Or, if you had close-up photography in mind, there's no better test than shooting for close-ups. Shoot color, black-and-white—whatever you wish.

46. Even if you don't intend to use flash—test your camera with it. You might decide to buy one later. If you can't borrow a flash gun or electronic flash unit from a friend, borrow one from the camera store before you take the camera home, and shoot some flash photos at the store. Develop the film when you get home to see if the sync is in good working order.